



Market Survey and Ten-Year Growth Plan

EXECUTIVE SUMMARY

BLUE YONDER AIRWAYS



Introduction

As Blue Yonder Airways moves from freight to passenger service, the Sales and Marketing Division is presented with a multitude of new challenges and opportunities. This report consists of a marketing proposal for the next ten years – a virtual blueprint for growth in our critical first decade as a passenger carrier. Our

resulting from a series of focus groups conducted by the market research firm Crump & Graham. The growth plan includes specific suggestions for ways to leverage our track record in the freight arena and our share of single-passenger airfreight sales, and ultimately expand into passenger sales. A detailed analysis of costs and

**\$150*
CASH
REBATE**

The Computer the Competition Loves to Hate. The ALR PowerFlex

**12.5MHz
1.44MB**



**We're not talking
bells and whistles.
We're talking
ALR's PowerFlex
performance.**



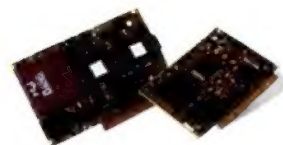
\$1395*

With today's leap-frogging technology, it takes more than just a faster PC to make the competition so upset. You have to deliver something they can't. The 286-based PowerFlex easily upgrades to 386SX™ or i486™ processing. And whatever future processing holds, the PowerFlex's innovative bus design holds your key to tomorrow. That's why the PowerFlex has received so much attention from today's premier computing publications. Byte Magazine wrote, "The PowerFlex offers the widest upgrade path that's currently available." The ALR PowerFlex was built with your future in mind. As technology and your processing needs grow, the PowerFlex can grow with you.

**"The PowerFlex
is the most
versatile system on
the market."**

BYTE November 1989

Still, the PowerFlex delivers much more. For a base price of only \$1395* (after rebate) you'll get a 12.5-MHz 286-based PC and 1-MB of RAM with built-in EMS 4.0 support, one 3.5" 1.44-MB floppy drive, a 40-MB hard disk and 101-key enhanced keyboard. Add only \$345* (after rebate) and you've upgraded to 16-MHz 386SX power and speed. The PowerFlex 386SX Module allows you to increase processing speeds by more than 25% and more importantly, gain immediate compatibility with all 386-based 32-bit software. We're even making i486 technology easily accessible. The PowerFlex i486 Module increases processing speeds by more than 510%. And for only \$2995, the cost of ALR's i486 upgrade solution,



Now until February 28, 1990 save \$50 with ALR's manufacturer rebate with the purchase of the 386SX Module.

ALR PowerFlex
12.5-MHz 80286
1-MB RAM exp. to 5-MB
1.44 Floppy Drive
6 Expansion Slots
4 Internal Drive Bays
40-MB Hard Disk
386SX Upgradeable
i486 Upgradeable
\$1495
-\$100 Manufacturer
Rebate
\$1395

Epson Equity II™
12-MHz 80286
640-KB RAM
1.2-MB Floppy
6 Expansion Slots
4 Internal Drive Bays
40-MB Hard Disk
Not Available
Not Available
\$2999
Not Available
\$2999

you'll have "One of the least expensive 80486s on the market".
Byte November 1989

To see in person just why ALR's PowerFlex has the competition so upset and get the name and phone number of your local authorized ALR reseller please call:

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**To qualify for the \$100 and \$50 rebates, you must purchase your PowerFlex and/or 386SX Module from 1/02/90 to 02/28/90.*

Mail in your rebate certificate with proof of purchase before March 31, 1990 and you'll receive a check directly from ALR.

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ALR Customers Cheer ALR Dealers Rejoice AST Faints

THE AWARD WINNING ALR FLEXCACHE 25386DT

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Manufacturer System	ALR FlexCache 25386DT Mod. 40	AST [™] Premium [™] 386SX/16 Mod. 40
RAM - Std.	1-MB	1-MB
Memory Cache	64-KB	16-KB
Floppy Drive - Std.	1.2-MB	1.2-MB
Hard Drive	40-MB <28ms	40-MB <28ms
Avail. Slots Total	8	7
Landmark Benchmarks *	41.5	23.1
Price	\$2695	\$3595
Video (VGA)	\$295 Opt.	Std.
25-MHz 80386 CPU	Std.	\$3295 Upgrade AST Fastboard [™] 386/25
Price	\$2990	\$6890

* Landmark Software version 1.1 benchmarks. The higher the rating the better.

* MIPS performance is based on the ratings of CPU/Memory in million instructions per second. MIPS Source PowerMeter[™] version 1.5 The Data Base Group, Inc. Upland CA. Disk access and transfer rates based on CORE Test 2.8 (CORE laboratories), CORE International.

New For The 90's. ALR's FlexCache 25386DT Model 40 **\$2695**

To kick off the new year right, ALR is offering the award-winning FlexCache 25386DT Model 40 at a price guaranteed to prompt celebration,

\$2695.

You'll be cheering as you experience the power of the world's fastest 25-MHz 386 PC, ALR's FlexCache 25386DT. You'll notice incredible speed delivered by FlexCache architecture, the industry's most advanced caching architecture. ALR's FlexCache architecture provides a 64-bit wide data path and 64-KB cache memory. When running MS-DOS[™], UNIX[™] and Novell[™] at 6+MIPS*, the speed of the FlexCache 25386DT becomes conspicuously apparent considering an 80286-based PC like AST's[™] Bravo[™] runs at a mere 1.6 MIPS.

The FlexCache 25386DT Model 40 is configured with 1-MB of RAM, 64-KB cache a 1.2-MB floppy drive in the classic desktop AT-chassis and a high-performance 40-MB (28ms) hard disk. With a 691-KB/sec. transfer rate, the 40-MB hard disk of the FlexCache 25386DT delivers 180% faster accesses and 60% faster data transfers as compared to the IBM[™] PS/2[™] Model 50 with its 20-MB hard drive.

Discover just why PC Magazine wrote, "the ALR FlexCache 25386 can't be beat."
- January 17, 1989 -

ALR designs the most comprehensive line of ISA, Micro Channel[™] and EISA-based PCs ranging from the 12.5-MHz 286 PowerFlex to 33-MHz 386 and

25-MHz i486 PowerCache 4 high-performance systems. To get additional information on the ALR FlexCache 25386DT and ALR's complete line of high-performance PCs as well as the name and number of your local authorized ALR reseller, please call:

1-800-444-4ALR

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AST, welcome to the neighborhood.

CIRCLE 165 ON READER SERVICE CARD

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newest technology in
high-speed memory!

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33 MHz
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CIRCLE 177 ON READER SERVICE CARD

Inside

Tax season starts early in the magazine's editorial offices.

Fall foliage is not yet at its peak when associate editor Jonathan Matzkin starts to round up the tax-preparation programs that had a share of the market in the previous season and are making revisions to incorporate 1989 tax changes. By Thanksgiving, tax attorney Laura Lou Meadows is deep into testing.

Most of the programs begin to show up on store shelves in December but usually get at least one upgrade before the height of the season.

Traditionally, the requests *PC Magazine* editors receive from friends and neighbors for personal tax help recommendations don't come until late February, and so we time our annual roundup to meet that peak demand.

This year, we've divided the coverage into two parts. This issue's After Hours section reports on the first programs to meet our early deadline, *AM-Tax*, *Andrew Tobias' TaxCut*, *J.K. Lasser's Your Income Tax*, and *TurboTax*. Next issue, we'll follow up with another batch.

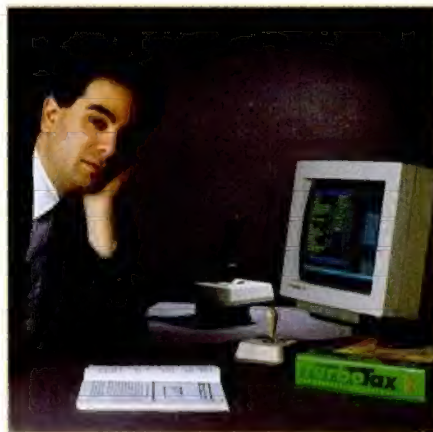
While tax programs have become easier to use and added more time-saving features every year, one of the most intriguing developments this year is the IRS's introduction of a broad electronic filing program. It makes sense only for professional accountants, but it's a sign of tax seasons to come. After Hours has the details on this develop-



ment and the results of the tax-software testing.

Tax returns are strictly personal, but PC-based presentations at meetings are growing more popular daily.

In this issue, we look at the latest advances in LCD projection panels. Projection panels, which use standard overhead projectors to display PC screens, have come a long way since we last looked at the technology; the first color panel is now available.



After Hours editor Jonathan Matzkin had to put recreational software aside months ago to file this issue's roundup before deadline.

One story we've been anxiously waiting to do for a long time is this issue's "Excel Under OS/2." It's not for lack of trying. We've pestered the staff at Microsoft almost weekly for news of their OS/2 spreadsheet, and we're as happy to publish this piece as they'll be relieved to have us off their back.

Also to help you share the vast databases distributed on CD-ROMs, we look at network-ready CD drives. In "Building Workgroup Solutions: Networking CD-ROMs," our LAN Labs team offers tips on installing a standard CD player on a network, tests network software to optimize the drive, and puts a few quarters in a CD jukebox that puts four disks on-line.

Oh, and if you're wondering whether any of this new hardware just might be tax deductible, in next issue's After Hours we'll present expert opinion from a Price Waterhouse CPA on the topic. —Gus Venditto

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PHOTOGRAPHY: THOM O'CONNOR

Experts rate QMS PostScript printers tops in every class

QMS PS-810

Although very similar to the LaserWriter IINTX, the QMS PS-810 is less expensive (\$2,004 less). The PS-810 provides comparable print quality and a parallel port, but its performance is not quite as fast as the IINTX's and it cannot be equipped with a hard disk. The PS-810's 2-megabyte base memory can be expanded to 3 megabytes, which accommodates enough fonts for most users. It can be equipped with the same 1000-sheet cut sheet feeder that fits on the QMS PS-1500, and it comes with the PS Executive Series printer utility as well. The PS-810 was the recommended printer in NSTL's last PostScript printer evaluation, and it may be an even better buy this year in view of QMS's recent price reduction.

- PC Digest Ratings Report
Vol 3, No. 4

standards. The card was a warranty.

If you have a LaserJet Series II and need PostScript compatibility, JetScript offers a ready solution. In fact, the smooth operation and impressive speed of this controller almost justify purchasing the LaserJet just to put the JetScript card in it.

Laser Connection/QMS PS-810. It has a reputation.

Steve Apike
& Stan Diehl
BYTE - 9/88

PC Magazine -
April 25, 1989

If you're looking for a laser printer with a PostScript language controller (and the famous 35 Adobe fonts built into ROM), take a look at QMS's superb PS-810. A fast, updated LaserWriter Plus clone, the PS-810 uses the later, superior Canon SX engine and adds that missing parallel connection—plus emulations that range from HP LaserJet Plus to Diablo 630 to HPGL. I use a PS-810 on a second PC in my office and greatly admire this tough, smart machine.

standard. In fact, the QMS should be ready to connect to just about any type of computer.

For high-volume desktop publishing, network situations, and other intensive PostScript applications where throughput, duty cycle, and paper capacity are issues, the QMS PS-820 is an extremely solid contender. When you add up the pros and cons and compare the PS-820 to other PostScript options, this printer looks very good indeed.

—Jon Pepper

—Jon Pepper
Personal
Computing

Congratulations. We are pleased to inform you that Macworld readers have voted QMS ColorScript 100 the 1989 World Class winner in the Color Printer category. Trophies will be awarded at our third annual World Class Awards Banquet at the Ritz-Carlton during the Macworld Expo Boston. We would like to thank you for your participation.

- MacWorld

QMS PS-1500

The QMS PS-1500 combines exceptionally fast performance and high-volume paper capacity. Features include a comprehensive control panel, 4 megabytes of base memory, and 35 internal font outlines. The PS-1500's unique PS Executive Series utility lets users print an advanced status page, download an error handler, and print screens. The PS-1500 can be equipped with a 1000-sheet cut sheet feeder and an external hard disk. The PS-1500's list price of \$7,995 makes it more economical for users with high-volume printing needs.

PC Digest
Ratings Report -
Vol.3, No. 4

QMS offers more Adobe® PostScript® printing solutions in more ways than any other company. And the products we offer continually receive high ratings from industry experts.

That's not surprising when you stop to consider that QMS was one of the first companies to adopt this versatile page description language as a standard.

Today, our expertise in applying PostScript solutions is second to none, enabling us to offer products

to users who need maximum performance and productivity. Which is why experts say QMS® PostScript products continue to set the pace for the rest of the industry.

So for expert guidance to the PostScript printing solution that fits your needs, call 1-800-631-2692, extension 232

In Alabama call (205) 633-4300.

Product	Print Speed	Max. Paper Size
QMS-PS® 810	8 ppm	8.5" x 14"
QMS-PS 810 Turbo	8 ppm	8.5" x 14"
QMS-PS 820 Turbo	8 ppm	8.5" x 14"
QMS-PS 1500	15 ppm	8.5" x 14"
QMS-PS 2200	22 ppm	11" x 17"
QMS ColorScript™ 100 Model 10	1 ppm	8.5" x 14"
QMS ColorScript 100 Model 30	1 ppm	11" x 17"
PS Jet™ (controller)	NA	NA
JetScript™ (controller)	NA	NA



QMS, Inc., One Magnum Pass, Mobile, AL 36618

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VideoLogic DVA-4000: Multimedia hardware/software development platform for any PC.
Microsoft Windows gets a full-fledged programmable DBMS with **Superbase 4**.
Cyrix's FasMath 83D87 coprocessor takes on the Intel 80387.
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Self-Sufficient Publishing
Luisa Simone/ You don't need a high-end package to create professional-looking documents, and these seven packages prove it. With price tags under \$300, they offer access to Bitstream fonts and more printer drivers than ever before—a low-cost solution so capable that “good enough” really *is* good enough.
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Springboard Publisher
Edit, Style, Layout, Publish
W & H ANNOL
OF SPATIAL RI
ARCHITE
BY RICH



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LCD Panels: 12 for the Road
Alfred Poor/ Lightweight and compact, LCD panels are the perfect vehicle for PC-based presentations you can take on the road. And you don't have to crowd around a 13-inch monitor to see the results. *PC Magazine* reviews units from 12 companies, including Computer Accessories, Kodak, and Sharp.
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Excel for OS/2: A New Home for an Old Favorite
Richard Hale Shaw/ How well does Microsoft's slickest Windows application hold up in the OS/2 Presentation Manager environment? How does it stack up against Lotus 1-2-3 for OS/2? *Excel for OS/2* delivers some pleasant surprises—among them smooth integration with diverse applications, Dynamic Data Exchange, and improved font support.
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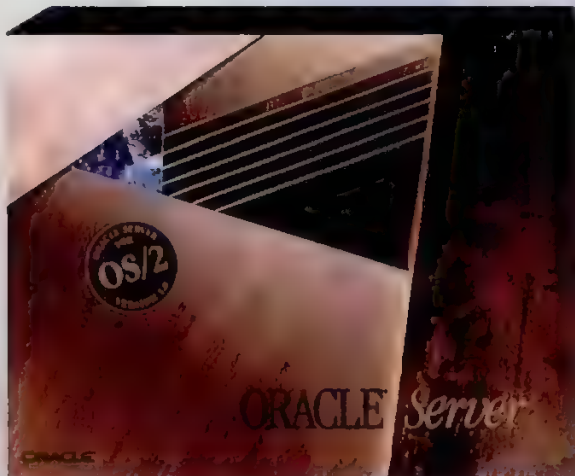
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January 30, 1990

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CIRCLE 242 ON READER SERVICE CARD

Peter Norton on Paul Mace:

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—Peter Norton
The Hard Disk Companion, p. 338

"Thank you, Peter."

Peter Norton should know. After all, Paul Mace *invented* hard disk unformatting.

True enough, Peter has "borrowed" from Paul in the newer versions of his popular Norton Utilities. But the master is still the master, and *nobody* beats **Mace Utilities** when it comes to recovering lost or damaged hard disk data.

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Sure, we're glad Peter Norton knows what the best hard disk utility program is. But he's not the *only* one—in fact, PC Magazine called **Mace Utilities** the "Best data recovery there is."

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Letters

WHOLE LOT OF KEYBOARD

Your extensive survey of alternative keyboards ("Wanted: More than Just a Replacement," *PC Magazine*, December 12, 1989) was beautifully done. Bruce Brown and Kellyn Betts deserve raises for the masterful way in which they objectively summarized the subjective opinions of your reviewers.

However, you did omit a keyboard that may be the most suitable for many of your readers: the Enigma Research 9000-48. This unit boasts 48 function keys on top. Now, I know that the macho view is that the *real* keyboard artist doesn't use function keys, because all those nifty shift-alt-letter combinations permit faster execution, but for most of us, the dedicated function key is by far the easiest way to go.

I know a number of writers who have switched to this keyboard, and none who have gone back.

Steven Goldberg
New York, New York

WORD GAMES

My apologies to Mr. Gates for what I am about to say—I could not resist. I've endured many months of Microsoft ads claiming that *Word* 5.0 is better, faster, smarter than the competition. And as I'm a *WordPerfect* fan/fanatic, I took obvious offense at the open shots that were fired at *WordPerfect* 5.0.

So hurrah for Edward Mendelson's article on word processors ("Two Aces and a King: The Big Three Word Processors Raise the Ante," *PC Magazine*, November 28, 1989)! I'm glad *PC Magazine* finally did the benchmark tests that show Microsoft is once again blowing smoke. Microsoft's "Let's slam *WordPerfect*" campaign is silly. In most cases, *WordPerfect* performs as well as if not better than *Microsoft Word*. The *PC Magazine* test results proved that. But *Word* 5.0 is a good program; I can't see the point in publishing misleading information about a competitor when *Word* is strong enough to stand on its own. Regardless, it appears



that the ads have not hurt *WordPerfect*; it's selling more copies than ever.

No one can doubt Microsoft's excellent contributions to the PC industry. However, its claim of "we can do it all, and better than anyone else" is obnoxious. Even if it were true.

Steve Dyson
Lancaster, California

The essential purpose of a word processor is the precise transfer of verbal thought to paper in the shortest possible time. By this standard, *XyWrite* and *Nota Bene* are the acknowledged world champions. If you didn't think so, you wouldn't be writing your own magazine in *XyWrite*.

You ill-served me as a subscriber when you chose three less-capable programs for your review of the three "leading" word processors. These programs "lead" only in the sense that more people know about them; by featuring them in your review, you make them even better sellers, which causes even more people to know about them, and so on. None of that makes any of these packages "great," which, as a user, is all I care about.

I buy *PC Magazine* for help in figuring out which program is best for me. The greatest service you can do is to "discover" a fabulous unknown program. There's no reason for me, or any of your other readers, to care about what the non-power user is buying.

Robert Sherman
Bethesda, Maryland

I just finished reading the November 28, 1989, issue and thoroughly enjoyed your feature on the big three word processors.

However, in the Summary of Features table on pages 106 and 107, it states that *WordPerfect* 5.0 does not do case-sensitive searches. Yet it does; the program not only looks for all uppercase or all lowercase but also searches for mixed case as well. If you want a global search (any case) you merely enter the search word in all lowercase and *WordPerfect* then finds any variation of the word.

Justine Cubbage
San Jose, California

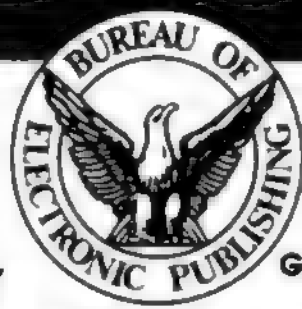
PC MAGAZINE While *WordPerfect* can search for uppercase letters only, it cannot search for lowercase letters only. Programs with truly case-sensitive searches can.—Edward Mendelson

FONT FACTS

In the November 28, 1989, issue, Gus Venditto incorrectly states that "Adobe typefaces are sold under license from Agfa Compugraphic, Bitstream, and Linotronic; all three now say they'll cooperate with Microsoft and Apple while continuing their relationship with Adobe" (Pipeline, *PC Magazine*, November 28, 1989). In fact, Bitstream does not license fonts from Adobe. We produce our own fonts for use with the PostScript PDL.

It is indeed true, however, that we support the new font format announced by Apple and recently adopted by Microsoft. We intend to release a substantial library of fonts in the new Apple format by the time Apple ships System 7.0.

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Letters

Realizing that the font market is a confusing one, we hope this clarifies our relationship with Adobe, Apple, and Microsoft.

Louise Domenitz

Director, Corporate Communications
Bitstream Inc.

Cambridge, Massachusetts

HOLD THE GUI

Regarding Diana G. Matthiesen's comments on graphical user interfaces (Letters, *PC Magazine*, November 28, 1989), I couldn't agree more. I also dread the elimination of command line interfaces. I'd rather keep my computer's RAM available for worthwhile tasks than to fill it up with icons and

Software companies

should be aware

that there are a lot

of us who aren't

afraid of our machine

We don't want

everything 'intuitive.'

GUIs that save me from the "horrors" of learning and typing commands. It amazes me how many people whose jobs involve computer use don't even know how to touch-type! To make all programs GUI-reliant would be like putting training wheels on all bicycles.

Software companies and computer publications should be aware that there are a lot of us out there who aren't afraid of our machines. We don't want everything "intuitive." We view learning as an opportunity; we view complexity as power and flexibility. Don't give me a program I can use to its limits in five minutes without even cracking the cover of the user's manual. Give me a program that has enough power and features that it takes me months to learn it all.

GUI, phooey!

Russell A. Spreeman
Colchester, Vermont

NOT SO CRAZY MISTAKE

In your November 28, 1989, issue, John C. Dvorak's Inside Track column features a section titled "Crazy Mistakes Dept. Redux." Here, Mr. Dvorak relates one "Crazy Mistake" as follows: "And then there's the expert who says 'I only keep programs on my hard disk: data files are for diskettes!'...Gads!"

Well, maybe I'm missing something, but that doesn't sound so crazy to me. In fact, it seems a whole lot smarter than writing everything to a hard disk which would have to be backed up to diskettes anyway. Think of the time (and error possibilities) necessary to then delete all the data on the hard disk to make room for more stuff that would then require more backups followed by more deleting and so on, ad infinitum. Call me crazy, John, but it seems like writing to a diskette in the first place makes more sense.

Eric Olsen

Grass Valley, California

COUNTERPOINT

The Letters column in the November 28, 1989, issue contained several blasts against *PC Magazine* columnists (Dvorak and Zachmann in particular) and against your editorial decision to no longer award an Editor's Choice to a 286-based computer. As my opinion on these matters is very much different than those published, I thought I would write and make a case for the opposing view.

I read *PC Magazine* because of its devotion to, and coverage of, the cutting edge of microcomputer technology. Furthermore, the knowledge and occasional sarcasm of columnists like Dvorak and Zachmann never fail to leave me with something to think, talk, or debate about. I consider *PC Magazine* to be the definitive voice in the world of computer literature. If you guys didn't call things as they were, I wouldn't renew. Keep up the good work.

Joe Cloutier

Yates Center, Kansas

RECOMMENDED READING

In the November 28, 1989, Advisor column, Lori Grunin recommends Scott Mueller's book *Upgrading and Repairing PCs* as "an excellent guide for troubleshooting hardware problems" and as an "aid to new-system buyers when they're making purchasing decisions."

Some 20 pages later, Mitt Jones recommends *The Winn Rosch Hardware*

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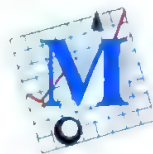


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Letters

Bible by Winn L. Rosch ("Winn Rosch Hardware Bible Offers Comprehensive Hands-On Advice," *PC Magazine*, November 28, 1989), and says: "if you're looking for a hardware primer and reference that is both comprehensive and comprehensible, nothing else comes close."

What I'd like to see is a follow-up article that compares and contrasts these two books. Perhaps Lori Grunin and Mitt Jones could get together and make a joint recommendation.

Joe Orzech
Seattle, Washington



The books are complementary—when I can't find an answer in one, the other usually has it. Mueller's book tends to go into more depth on different hardware platforms, while Rosch's book covers more-technical material. Both volumes are highly recommended.
—Lori Grunin.

TAX EVASION

In the November 28, 1989, issue, it is stated that one advantage of buying through mail-order is the avoidance of sales tax on out-of-state purchases ("Out on the Street: What PCs Really Cost," *PC Magazine*,

If PC Magazine
didn't call things
as they were, I
wouldn't renew.

November 28, 1989). Not so in Maryland. Maryland assesses a Use Tax equal to the difference between the sales tax paid and the sales tax which would have been collected by the state if the item were bought in Maryland.

In any inquiry, Use Tax liability is questioned. Use Tax is assessed on hardware, software, supplies, and many other items. Since other states may have a similar tax, please don't sully a fine magazine on such a small point.

Bobbie L. Thompson
Gaithersburg, Maryland

NOTHING BUT THE FACTS

Thanks for Winn L. Rosch's informative, no-witchcraft article on PC radiation ("The Big Question: Is the PC Environment a Safe Place to Work?" *PC Magazine*, December 12, 1989). It was nice to see that you gave us the facts, instead of sensationalism.

Michael Covington
Athens, Georgia

CORRECTIONS & AMPLIFICATIONS

In "The New Lotus 1-2-3s: Just Enough, Just in Time" (*PC Magazine*, November 28, 1989), the benchmark test results for *Microsoft Excel* were obtained on a 640K system. Had the tests been run on a 1MB system as they were for *Lotus 1-2-3*, Release 3, (which requires 1MB of RAM), a variety of caching options could have been used to speed up *Excel*'s performance in loading and saving files, executing macros, and charting. Furthermore, file load tests for all packages were conducted using native formats, not .WK1 files as was reported in one benchmark caption.

In the fact file accompanying the review of the ALR PowerCache/4 (First Looks, *PC Magazine*, December 12, 1989), the incorrect company was identified. The PowerCache/4 is manufactured by Advanced Logic Research.

In the November 28, 1989, issue, IBM's *DisplayWrite 5/2 Composer* was reviewed ("Two Aces and a King: The Big Three Word Processors Raise the Ante," *PC Magazine*, November 28, 1989). This product is not to be confused with the *WordMARC Composer* and *WordMARC Composer+* word processing packages from MARC Software International.

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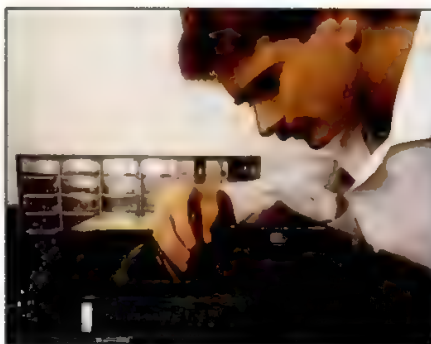
Our tour starts outside our building with most of our over 90 employees greeting you. We moved into this custom designed facility last Spring. We're starting our 7th year in State College, PA, also the home of Penn State University. In fact, many of our employees have ties to the school.

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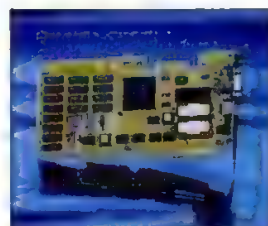
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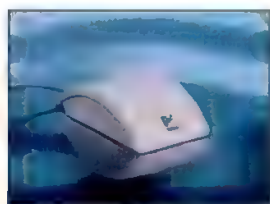
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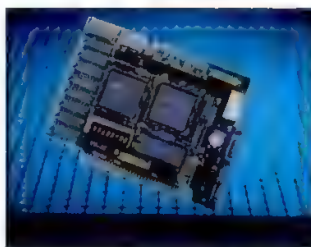
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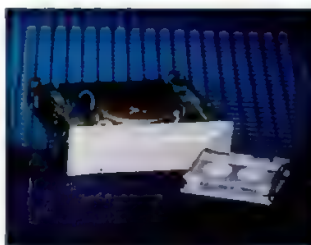


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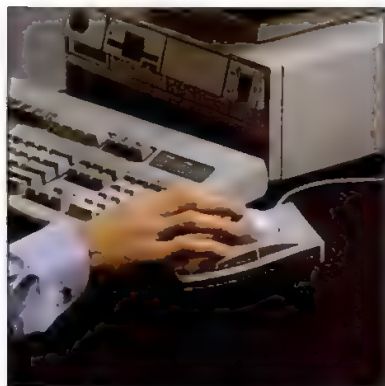
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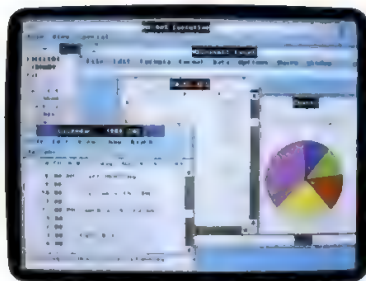
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*Setting new standards
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by Lori Grunin

Advisor

EQUATION SOLVERS

I'm looking for a math program that can solve equations with about 25 unknown variables. Can you give me some suggestions or refer me to a software company specializing in these math problems?

Van Der Kelen
Brussels, Belgium



I assume you're talking about finding numerical solutions to those equations; if so, check out *TK! Solver Plus*, Version 1.1 (\$395; Universal Technical Systems, 1220 Rock St., Rockford, IL 61101; (800) 435-7887, (815) 963-2220) or *Gauss*, Version 2.0 (\$495; Aptech Systems Inc., 26250 196th Pl. SE, Kent, WA 98042; (206) 631-6679), both of which were reviewed in "Better Tools for Higher Math: When Numbers Count," in the March 14, 1989, issue of *PC Magazine*. *Gauss* also comes in a 386-specific version, *Gauss386* (\$695), which supports extended/expanded memory.

On the other hand, if you're trying to find the symbolic solution to that large a system of equations, you're on shakier ground; as amazing as today's CPU and RISC chips are, they don't pack nearly enough power to handle the calculations in a reasonable amount of time (that is, within your lifetime).

The closest contender in this category is the 386 version of *Mathematica* (Version not requiring math coprocessor, \$695; 386/7 version, \$995; 386/Weitek version, \$1,295; Wolfram Research Inc., P.O. Box 6059, Champaign, IL 61821; (217) 398-0700), but even the Wolfram people admit they've never tried to solve anything quite that big. Soft Warehouse Inc.'s *Derive*, Version 1.3 (\$200; 3615 Harding Ave., #505, Honolulu, HI 96816; (808) 734-5801; see page 48 of the September 26, 1989, issue of *PC Magazine* for more information) can handle up to ten variables in a system of linear equations.

Even if your interests are numerical, the symbolic math programs may be of interest; with 25 variables, round errors

- **EQUATION SOLVERS:**
Practicing higher math with your PC.
- **JACK OF ALL TRADES:**
Supplies that help you get on-line when there's no RJ-11 near.
- **EVGA PAINTING:**
Paint programs that utilize high-res graphics hardware.

could be serious, and the ability of the symbolic programs to do exact rational, arithmetic, and arbitrary-order real arithmetic may be significant. If you need a symbolic solver, try calling Wolfram's or Soft Warehouse's technical support and delineate for them exactly what it is you're trying to do. They should either put you on the right track or tell you that there's no path to follow right now.

JACK OF ALL TRADES

Do you have any advice on adapters to connect a PC modem to the telephone line when the telephone is *not* constructed with modular wiring? I recall seeing an advertisement long ago in a journal for a device that screwed directly into the handset of a telephone (after you remove the mouthpiece, I believe) but I have seen nothing like that since.

Myron L. Mills
Nashville, Tennessee



I bet lots of people get as annoyed as I do when I check into a hotel with my state-of-the-art portable computer, only to discover that the room is technology-hostile and it'll be another week before I see my e-mail. Some hotels have installed phones with an extra RJ-11 jack, but for the time being they're less

common than one would like.

There are, however, a couple of products that can help alleviate your aggravation. Unlimited Systems Corp.'s Konexx 106 (\$99 plus \$3 shipping; Model 107 for fax and data, \$124 plus \$3 shipping; 9225 Chesapeake Dr., Suite J, San Diego, CA 92123; (619) 277-3300) sounds a lot like the device you've described. The Konexx plugs into the phone's handset jack; if the cord is hardwired in, you can use the alligator clips that come with it to connect the unit to the phone's microphone terminals. It works with digital PBXs, another bane of the telecommunicator's existence.

A similar solution is the Road Warrior Toolkit or the Road Warrior Toolkit Deluxe (\$49.95 and \$139.95, respectively; Computer Products Plus Inc., 16321 Gothard St., Unit F, Huntington Beach, CA 92647; (714) 847-1799).

The basic Toolkit contains items that you can amass for yourself at your local electronics store—a screwdriver, a pocket knife, a lighted magnifier, a modular Y connector, an in-line coupler, a cable with alligator clips, and a modular extension cord—as well as instructions for rigging it all up to work under various conditions. The Toolkit Deluxe includes the CP+ Connection, also sold separately for \$99, which allows you to coexist with a digital PBX.

EVGA PAINTING

I recently purchased an 80386-based computer with an EVGA card and would like to find a paint program that will support higher-resolution graphics such as 800 by 600 with 256 colors or 1,024 by 768 with 16 colors. Do any relatively inexpensive programs exist that support these high-resolution modes?

Al Yask
Chicago, Illinois



High-resolution paint programs are beginning to pop up all over the place, although none yet fall into the truly low-end category; their prices range from around \$130 to almost \$300.

Advisor

Each program has particular strengths and weaknesses, so you really need to determine which capabilities most closely suit your needs; for instance, if you'll be using the program to create images that will be exported to a desktop publishing program, you probably want a package with an accurate conversion utility that creates usable export files. On the other hand, you may prefer the largest and most flexible set of tools and not care about file formats.

Z-Soft Corp. (450 Franklin Rd., #100, Marietta, GA 30067; (404) 428-0008) offers several packages that fit your criteria, although the company's product line gets a bit confusing. *PC Paintbrush Plus* (\$199.95) and *PC Paintbrush Plus for Windows* (\$149) both support 1,024 by 768 by 16 colors (256 colors with IBM's 8514/A adapter) but they don't work in lower-resolution modes, such as 320 by 200 by 256 colors, and have pretty limited tool sets. By the time you read this, *PC Paintbrush IV Plus*, in both versions, should be available.

The *Microsoft Windows* version doesn't support gray-scale scanning, and is limited to the standard *Windows* drivers for display and memory support. To *PC Paintbrush Plus*, *Publisher's Paintbrush* (\$285) adds more expanded memory support to enable zoom-out editing as well as a few other features. (*PC Paintbrush Plus* uses expanded memory for some operations but caches images to disk; hence, there is no zoom-out editing.)

Deluxe Paint II Enhanced (\$129.95;

High-resolution paint programs are beginning to pop up all over the place, although none yet fall into the truly low-end category.

Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404; (415) 571-7171; last reviewed on page 48 of the December 26, 1989, issue of *PC Magazine*) isn't the easiest program to learn, but provides an extensive set of tools. It supports painting in more than 25 different modes (depending on your EVGA card), including 1,204 by 768 by 16 colors.

With its pop-up instead of pull-down menus and non-icon-based interface, *ColorIX VGA Paint*, Version 1.2 (\$199; Rix Softworks Inc., 18552 MacArthur Blvd., #375, Irvine, CA 92715; (714) 476-8266; Version 1.1 was reviewed on page 56 of the February 14, 1989, issue of *PC Magazine*) takes a little getting used to. It has some nice features, however, such as a good set of tools and an excellent airbrush. The package supports resolutions up to 1,024 by 768 at 16 colors.

ASK THE ADVISOR

Send your questions to Advisor, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload to PC MagNet (see the "By Modem" sidebar in the Utilities column for access information). Please specify your equipment. ■



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First Looks

Hands-on Reviews of the Latest Products

Compaq Systempro Heralds New Generation of Multiprocessor PCs

HANDS ON
by Robert W. Kane

As a PC, the new Compaq Systempro is one of the most powerful you'll find. As a file server, it offers new levels of performance and throughput. And as a harbinger of the direction that the PC will take over the next decade, the Systempro foretells exciting new developments.

In their design objectives for the Systempro, Compaq's engineers departed from the company's traditional single-user orientation and instead aimed to build a high-performance file server and multiuser host. This emphasis is evident in the Systempro's use of new technologies, from its dual-processor capability to the new intelligent drive array; from its EISA bus to its high-performance VGA controller; from its 256MB RAM capacity to its 1.6-gigabyte disk capacity.

All of this technology needed much more space than Compaq's conventional large-footprint desktop unit could offer. Thus, the Systempro is the first Compaq configured as a tower system.

The base Systempro comes equipped with a 33-MHz 386 processor board that has an 82385 Intel cache controller supervising 64K of 25-nanosecond cache memory. Sockets on the processor board can accommodate both an Intel 80387 and a Weitek 3167 coprocessor simultaneously. Located directly below the processor board is another slot that can accept a second processor board. This board can house either another 33-

Compaq's Systempro offers dual-processor capability and a new intelligent drive array.



MHz 386 processor or a 33-MHz 486 processor board, adding considerably more power.

Processor boards are interchangeable between the two slots. As such, the Systempro will be able to accommodate

two 80486 processor boards when they become available from Compaq.

Just below the slots for the processors are two slots to accommodate 32-bit memory

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DVA-4000 Makes Live-Motion Interactive Video Application Development as Easy as a Batch File

HANDS ON
by Lori Granger

You may have heard of Digital Video Interactive (DVI), the eagerly awaited technology that lets you incorporate live-motion video from a random-access device into interactive applications. Well, when nobody was looking, the technology arrived; VideoLogic's DVA-4000 board and Multimedia Interactive Control (MIC) System software deliver DVI application-development tools into the hands of anyone who can program DOS's batch language.

The DVA-4000 (Digital Video Adapter) board, with its

piggyback DFA-4000 (Digital Feature Adapter) Framestore Feature Card, displays live-motion and still-frame video on a standard VGA monitor, using input from NTSC, PAL, RGB, S-VHS, CD-I, and DVI sources. With the auxiliary input connector (\$95), you can manipulate any two of these sources simultaneously, and on-board genlocking allows you to overlay graphics and text.

All of this can take place in the background. As a simple example, picture yourself working with an application such as *Lotus 1-2-3*. Instead of the familiar black background, however, visualize your favorite movie

playing underneath your spreadsheet, so that Dorothy's ruby slippers skip along your Gross Revenue cells as well as the Yellow Brick Road.

While the card is powerful, it's the MIC software that makes the board a truly formidable tool. In addition to full-screen video, the software lets you display single or multiple still-frame windows on a screen with, for example, real-time video running in one window. When overlaying graphics and text, you can control which colors are solid, translucent, or transparent to video, as well as fades and dissolves for graph-

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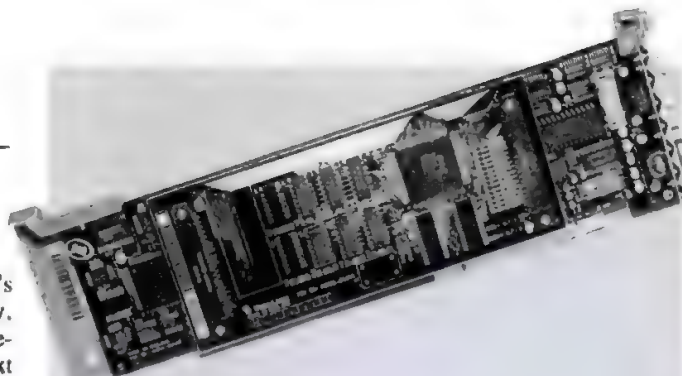
DVA-4000

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ics, audio, and video. There's normal, slow, and reverse play, with frame indexing and frame-number reporting. With the next release of the software, due to ship in February, you will be able to capture and redisplay still-frame video.

Be aware, however, that if you're using a laserdisk player for input, all of these neat capabilities work only with CAV (Constant Angular Velocity) laserdisks, while most entertainment laserdisks use the CLV (Constant Linear Velocity) format. The only thing you can do with a CLV laserdisk is play it straight through. Also, the board does not support all players; one requirement is that the player have an RS-232 serial port for data I/O.

The software lets DOS recognize the board as a device,



Both the DVA-4000/MCA and the DVA-4000/ISA (not shown) come with a DFA-4000 Framestore Feature Card, the brains behind the DVA-4000's ability to control the placement and size of video windows.

input from DOS devices, and it allows you to create interactive applications. A utility provides coordinate control when programming for Microsoft-compatible mice, touchscreens, and light pens.

The MIC software comes with the Applications Management System (AMS), a basic batch-file-type menuing system from which you can launch programs and take care of your en-

vironmental housekeeping. In an ISA system, you need a VGA card with a feature connector; the board uses the VGA's capabilities rather than duplicating them. The MCA version plugs into the PS/2's video extension slot, so the DVA-4000/MCA and an 8514/A adapter can't coexist.

I tested the MCA board in a PS/2 Model 70-A21 and the ISA board in an 8-MHz AT, with an IBM 8514/A monitor. The display quality of both adapters was very good, with no perceptible flicker visible in overlaid images.

The highest resolution the card supports when combining video and graphics is 640 by 480 regardless of the VGA card used. Although 64 colors are accessible, you can only use 16 at a time; in MCGA mode, you have access to 256 colors. Colors are manipulated using their DOS numbers (e.g., 0 for black), and the colors above the first 16 have to be remapped into the lower ones with the SETCOLOUR command in order to be recognized. You set the video brightness with the hardware configuration program; in the forthcoming software upgrade, the setup program will also allow setting of hue, saturation, and contrast.

Creating programs using

batch files is syntactically easy and straightforward but all the ECHO and > MIC commands make it tedious. It's hard enough worrying about correct command-line parameters without having to deal with "Bad command or filename" messages because you forgot to ECHO some command. Here, I found VideoLogic's *TSR Toolbox Plus* (\$195) to be invaluable. The *Toolbox's* macro editor is especially nice, allowing you to pop up an edit window, make a change, and hit F3 to re-run the macro or F4 to execute just that line; best of all, macros don't require DOS command language.

The libraries created with the *Toolbox* are ASCII files, so you can easily cut-and-paste among macros and libraries. The *Toolbox* also provides a



The window on the right side contains live video input from a laserdisk player, running within an application. The code used to control the size, content and position of the window is on the left.

MIC, the same way it does COM1, thus allowing you to address the card with DOS's redirection symbols. For instance, if you run a batch file with the command ECHO PLAY > MIC, the disk plays. This lets the DVA-4000 interface with any application or programming language that can output to or

perform the same wonders with

The DVA-4000 lacks a DSP and, therefore, the ability to

FACT FILE

DVA-4000/ISA
DVA-4000/MCA
VideoLogic Inc., 245 First St.,
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ISA version, serial port
configurable as COM1 or
COM2, DOS 3.1 or later.
In Short: A powerful
combination of video board and
software that lets anyone who
can program a batch file create
live-motion interactive video
applications.

CIRCLE 447 ON READER SERVICE CARD

useful pop-up command line to execute individual operations, and it extends your palette control to the creation of colors (using RGB levels) and color libraries.

In addition, VideoLogic sells two other development tools (I didn't look at those), which also cost \$195 each. *Monitor* lets you trace program operation on a second, monochrome monitor if you're running on an AT, and *Mask* is a TSR that speeds alternate-input-

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First Looks

DVA-4000

CONTINUED FROM PAGE 34
device programming.

The MIC System documentation, modeled after IBM's *DOS Reference*, tries to be helpful, but it will succeed only if you've already learned the system. Luckily, it's easy to pick up most of the commands in an afternoon by trying them one by one and by analyzing the demo programs. Also, until you've experimented a bit, you don't really know which programs and configuration files you need to load to operate the system properly. For instance, the installation program sets a default configuration that doesn't recognize any of the Framestore Feature Card commands.

The DVA-4000 inevitably (but inappropriately) invites comparison with IBM's Audio Visual Connection. The AVC is strictly a presentation tool that allows you to record, manipulate, and play back audio and still-image video. For those interested in incorporating their own audio, VideoLogic claims that the DVA-4000 can work with the Audio Capture and Playback Adapter card.

Granted, at \$2,495 for the board, plus the cost of the system to run it on, plus the cost of a laserdisk player or S-VHS recorder, the DVA-4000 isn't an inexpensive proposition. On the other hand, it's relatively easy to program, so you probably won't need to hire outside help. Most important, if you've been waiting for the technology to arrive to create interactive video applications, you need wait no longer. ■

COMPAQ

CONTINUED FROM PAGE 33

boards. One of these slots is occupied by 4MB of 80-ns. page-mode memory and incorporates a VGA pass-through connector for the integrated video located on the motherboard. If the system is configured with two system processors, the maximum system RAM that can be installed is 160MB, using mod-

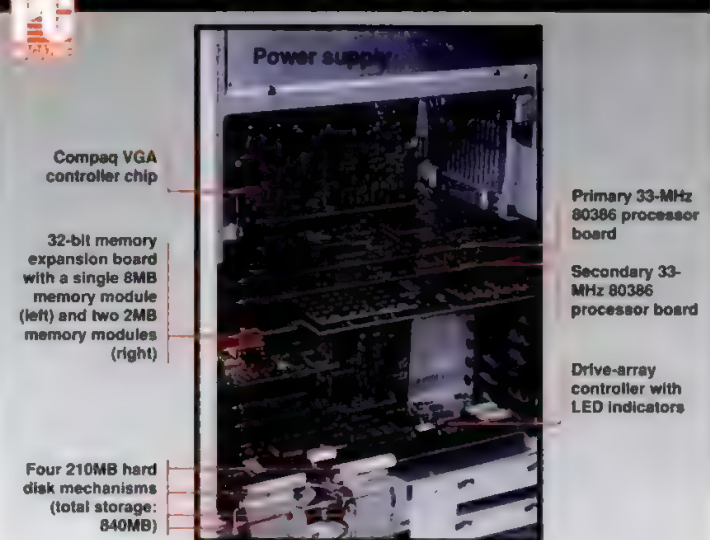
ules employing 4-megabit chips. With only one processor installed, the second processor slot doubles as a 32-bit memory slot, allowing for total RAM expansion of 256MB.

Few users will configure their Systempros with this much memory at first: an 8MB memory module that uses 4Mb chips costs \$5,299, while the 32MB memory modules will cost you an incredible \$21,999, more than the \$15,999 base price (including one processor, 4MB RAM, a 240MB hard disk, and a 1.2MB 5.25-inch floppy disk drive) of the Systempro itself. The list price of our evaluation unit, which came equipped with two processors, 12MB of RAM, and 840MB of hard disk space, is a whopping \$42,356.

Besides the four processor/memory slots, the Systempro sports seven EISA (Extended Industry Standard Architecture) bus connectors. These slots support conventional 8/16-bit AT-style ISA interface boards, as well as the new-generation 32-bit EISA boards. The EISA bus allows for 32-bit bus mastering, as well. Bus mastering is handled by interfaces that contain their own processors and can perform data transfers to and from main system memory without having to tie up the system processor. Due to its 32-bit data path and faster bus arbitration than the ISA bus, the Systempro's EISA bus can move data at a rate of up to 33MB per second.

Following the switchless configuration design of IBM's PS/2 series, the Systempro comes with its own EISA-configuration floppy disk. As you add or remove interface boards from the Systempro, you must run this configuration utility, which will allow you to configure any EISA board through software. The utility also has files that detail how to set the switches and jumpers for many

ANATOMY OF THE COMPAQ SYSTEMPRO



popular ISA boards. Once everything is set, it checks to see if there are any conflicts among the installed devices and alerts you if anything needs to be changed.

Compaq's engineers saw fit to take advantage of the EISA

bus in the Systempro by developing a new EISA-based disk system. Called an Intelligent Drive Array (IDA), its design addresses the needs of a high-performance file server or multiuser host.

The controller is a 32-bit EISA-bus master that contains an Intel 80186 processor running at 16 MHz. The processor has its own 128K of ROM and 256K of RAM, which allows the controller to operate independently of the system processor. In addition, the controller has a separate 128K of 30-ns. SRAM, which is used to buffer the reads and writes performed at the 33MB-per-second transfer rate of the Systempro's EISA bus.

The controller can hook up to eight different drive mechanisms. Each 3.5-inch Connor mechanism can hold a maximum of 210MB, making the total storage capacity in the Systempro 1.6GB. Unlike other PC disk controllers, which treat each physical drive as a logical drive, the Intelligent Drive Array can treat multiple physical drives as one logical drive. As a result, all 1.6GB can be addressed as one logical drive, something that has long been possible with minicomputers and mainframes.

The IDA has several features that distinguish it from any other disk controller ever found in a

FACT FILE

Compaq Systempro

Compaq Computer Corp.,
20555 SH 249, Houston, TX
77269-2000; (713) 370-0670.

List Price: Compaq Systempro 386-840: 4MB RAM, 840MB hard disk, 1.2MB 5.25-inch floppy disk drive, \$25,999; second 386/33 system processor board, \$3,499; 33-MHz Intel 80387 coprocessor, \$1,599; 33-MHz Weitek 3167 coprocessor, \$2,199; 8MB dual-socket memory module, \$4,599; 1.44MB 3.5-inch floppy disk drive, \$275; 150/250MB tape drive, \$1,999; 2,400-bps modem, \$599; 14-inch VGA monitor, \$699; MS-DOS 4.01, \$150; OS/2 1.1, \$340; technical reference guide, \$399.

In Short: More a file server multiuser host than a traditional PC, the Compaq Systempro offers dual-processor capability, a new intelligent drive array, EISA bus, a high-performance VGA controller, and a capacity of up to 256MB RAM and 1.6 gigabytes of disk storage. Its hefty price buys minicomputer power.

CIRCLE 443 ON READER SERVICE CARD

CONTINUES ON PAGE 36

First Looks

COMPAQ

CONTINUED FROM PAGE 35

PC. To begin with, it employs three different methods of fault tolerance to ensure high data reliability. The first is *drive mirroring*, which uses half the system's disk capacity to mirror, or duplicate, the data on the disks. If a drive fails, another copy of the data in the system can continue to be used.

Data guarding, which can only be enabled in four- or eight-drive systems, uses one of the drives to store encoded data. When a drive fails, the encoded data in combination with the data found on the remaining functioning drives automatical-

ly reconstructs the data on the failed disk. This method uses only one-fourth of the disk capacity in the system, as opposed to mirroring, which uses one half.

The third method, *controller*

duplexing, uses two IDAs and two sets of disk mechanisms. All data on one disk system is mirrored on the other disk system. In the event of a failure of one drive or controller, the system will continue to function

normally.

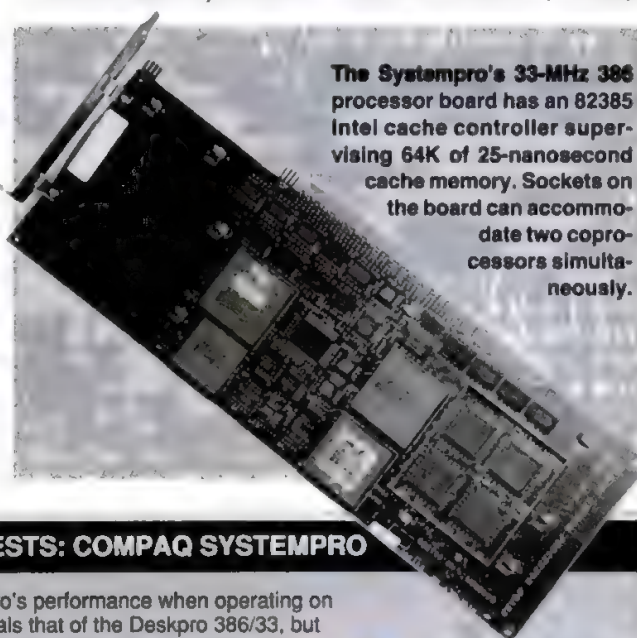
An audible tone and a flashing LED on the back panel indicate to the operator/administrator that a drive failure has occurred, and the LED indicates which drive has become faulty. A switch on the back panel can mute the audible signal. It's very loud and gets your attention right away.

As if all this technology wasn't enough, the Systempro also incorporates Compaq's new integrated video graphics system with graphics accelerator. Essentially a redesigned VGA controller chip, this chip performs bit-block transfers (bitblts) in hardware, making the Systempro 25 percent faster in certain graphics operations over a standard 16-bit VGA system. While VGA graphics are superfluous in a file server, Compaq indicated this VGA controller will go into its other desktop products that incorporate VGA graphics on the motherboard.

What about performance? As the PC Labs benchmark tests show, the Systempro is nothing but another fast 33-MHz computer running under DOS. Keep in mind that DOS doesn't support the second processor and 32-bit data transfers and bus mastering by the drive array. These technologies only come into play when using Novell's *NetWare/386*, OS/2 with *Compaq LAN Manager*, or Unix—further proof that the Systempro is more of a file server or multiuser host than a DOS machine.

What about price? When you consider that the Systempro is as powerful as a minicomputer of five years ago, and that you're getting a file server/host that can accommodate hundreds of users and can be upgraded as you add more—what Compaq calls *scalable performance*—its price is reasonable.

Arguably the first multiprocessor system to ship, the Systempro is by no means the last. As other companies have imitated Compaq's desktop and portable machines, so too will the Systempro be copied. The Compaq Systempro heralds the next step for PCs in the coming decade.



The Systempro's 33-MHz 386 processor board has an 82385 Intel cache controller supervising 64K of 25-nanosecond cache memory. Sockets on the board can accommodate two coprocessors simultaneously.

BENCHMARK TESTS: COMPAQ SYSTEMPRO

The Compaq Systempro's performance when operating on a single processor equals that of the Deskpro 386/33, but the exceptionally fast time on the BIOS Disk Seek test hints at the power of Compaq's new drive-array technology.

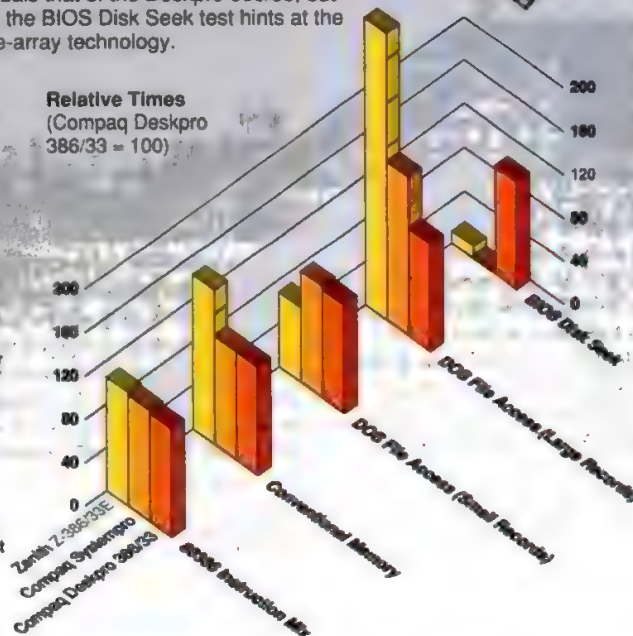
The 80386 Instruction Mix benchmark test times a series of tasks specific to the 80386 chip. Since this test shows how the CPU operates in the context of the bus, processor, system memory, and motherboard architecture, a faster time means better overall computer performance.

The Conventional Memory benchmark test measures the read/write speed of the first 640K of memory. Slower relative times can indicate the presence of memory wait states or memory chips rated at slower access speeds.

The DOS File Access (Small Records) benchmark test times disk throughput as a result of mechanical disk drive speed, hard disk controller function, and bus speed. The test is performed without software disk caching. Fast times are advantageous for programs that work with many short segments of data.

The DOS File Access (Large Records) benchmark test times disk throughput as a result of mechanical disk drive speed, hard disk controller function, and bus speed. This test minimizes the effect of small hardware caches on disk subsystem performance. It is performed without software disk caching. Fast times are

Relative Times
(Compaq Deskpro
386/33 = 100)



advantageous when large files are loaded.

The BIOS Disk Seek benchmark test measures mechanical track-to-track

disk drive access times. Fast times are helpful with programs such as databases, which often store and must later find data in many separate places on a drive.

Performance Times
(Times given in seconds)

	80386 Instruction Mix	Conven- tional Memory	DOS File Access (Small Records)	DOS File Access (Large Records)	BIOS Disk Seek
Zenith Z-386/33E	1.74	0.36	35.98	10.32	1.92
Compaq Systempro	1.70	0.25	53.52	5.71	0.38
Compaq Deskpro 386/33	1.66	0.25	52.27	3.89	16.33

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First Looks

Superbase 4: Programmable DBMS Comes to Windows

HANDS ON
by Richard Hale Shaw

Major database products like *dBASE IV* and *FoxPro* offer windowing facilities, but they are strictly character-based programs; none of them take advantage of the *Microsoft Windows* operating environment. Changing that is Precision Software's *Superbase 4*, a \$695 *Windows*-based relational DBMS with a powerful BASIC-like data-management language (DML) and an object-oriented Forms Designer that can be mastered by nonprogrammers.

At first glance, *Superbase 4* closely resembles the vendor's earlier program *Superbase 2* (First Looks, September 12, 1989, page 43). The VCR-style browsing buttons, built-in tele-

communications features, and facilities for interactive data definition and SQL-like relational queries are all there, as well as the ability to browse *dBASE* files and support a variety of import/export formats. But *Superbase 4* also includes all you'll need to create stand-alone *Windows*-based database applications, including a runtime version of *Windows*.

The full-featured *Superbase* DML is derived from BASIC but is more powerful than the *dBASE* language, with a label-based subroutine structure and over 200 commands and functions. There are no mysteries about what each command does: in addition to the documentation, you can open a window to test each command individually before adding it to a

program. The built-in windowing program editor automatically tokenizes your programs when it saves them, encrypting and condensing them. The DML provides complete access to the facilities of the *Superbase 4* interface, including function keys, pull-down menus, dialog boxes, and push buttons: you can change the existing menus to suit your application. There are also commands to utilize *Windows*'s Dynamic Data Exchange (DDE).

The DML offers support for three-dimensional arrays, and you can use the relational query facilities to embed SQL-like SELECT statements in your program. When you perform a search, *Superbase* retrieves all the records that meet the search criteria, allowing your program to manipulate them as a single database table. The package includes meticulously documented sample applications that demonstrate the use of the DML. A runtime facility is available separately for stand-alone applications.

The *Superbase 4* Forms Designer is an object-oriented facility for creating customized screens, interfaces, and dialogs and can be used by anyone who can master its paint-program approach. Once you create your database files, you can use the Forms Designer to position the fields and labels on the screen. *Superbase 4* will open the appropriate files and maintain the relations between them, including one-to-many and relational joins. From the Forms Designer toolbox, a mouse click will select push buttons, lines, boxes, fill patterns, and text in every possible *Windows* font, pitch, style, or color—even images from .PCX, .TIF, .IMG, or .WMF files.

Superbase 4 includes a WYSIWYG report generator that offers you complete control over printer fonts. The program uses virtual file-handling facilities to let you create up to 999 indexes per database file, and there is full LAN support, with file and record locking and variable retry and delay.

Superbase 4's speed doesn't come near that of character-based database systems like *FoxPro*. But as future versions of *Windows* and *Superbase* reduce program overhead, this should improve dramatically. While OS/2 (already a high-performance operating environment) will be able to run *Windows* applications in its next release, you may want to stick with your character-mode DBMS for the time being—assuming performance issues strongly outweigh the advantages of using a GUI-based DBMS today.

In all, *Superbase 4* is one of the finest professional development systems available for writing database applications. As a vehicle for creating *Windows*-based database applications, it's a product that a great many programmers have long been waiting for.

List Price: *Superbase 4*, \$695; 5-node LAN pack, \$995.

Requires: 640K RAM, hard disk, DOS 3.3 or later. Precision Software, 8404 Sterling St., Irving, TX 75063; (800) 562-9909, (214) 929-4888.

CIRCLE 446 ON READER SERVICE CARD



BENCHMARK TEST: SUPERBASE 4

In all but the Import test, *Superbase 4* plods along well behind *dBASE IV*. Enabling *Windows*'s disk cache, SMARTDRV.SYS, appeared to improve performance by about 20 percent, so *Superbase 4* users should consider configuring part of their *Windows* memory for SMARTDRV.

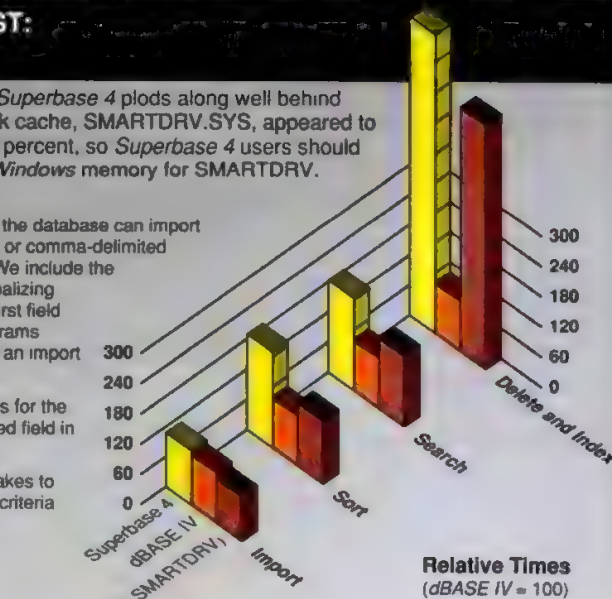
The **Import** test measures how quickly the database can import an ASCII file (of either fixed field length or comma-delimited format) with an index on the first field. We include the indexing portion of the test to avoid penalizing programs that automatically index the first field during the data conversion. Some programs require a two-step process for this test: an import followed by indexing.

The **Sort** test measures the time it takes for the package to sort the files on an unindexed field in ascending order.

The **Search** test measures the time it takes to locate the first record that satisfies two criteria (make = Fendhi and model = coupe).

The **Delete and Index** (four-column version) test measures the time required to remove four columns (Units, SellPrice, BuyPrice, and TranDate) from a Product table created for this task, and then to reindex the file if necessary.

The timings were performed on an 8-MHz IBM AT with 640K of conventional memory (1024K on the motherboard) and 640K of extended memory (above 1MB), for a total of 1664K.



Performance Times (Times given in seconds)	Import	Sort	Search	Delete and Index
Superbase 4	319.33	173.73	23.72	225.19
dBASE IV	298.00	92.00	13.00	38.00
Superbase 4 (with SMARTDRV)	265.18	116.44	18.18	185.32



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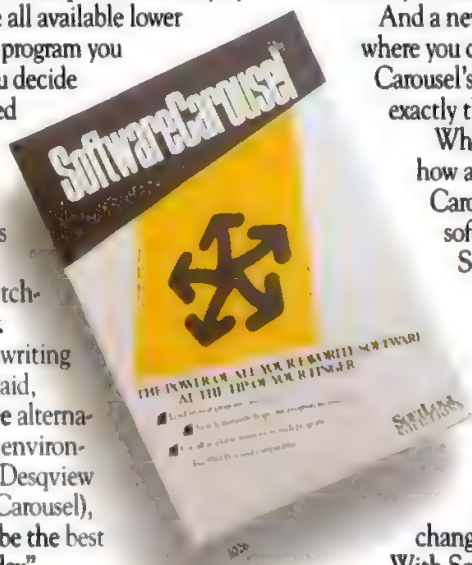
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Doing More For The Data Process

First Looks

The Brooklyn Bridge: From File Transfer to File Management

HANDS ON
by M. David Stone

When *The Brooklyn Bridge* was introduced, it was an innovative utility with a single purpose: high-speed file transfer between computers with dissimilar disk drives. Now, in Version 3.00, the program has added 175 file-management utilities. Fifth Generation Systems calls its \$139.95 product a file-transfer and file-management program. Indeed, the company could legitimately call it a DOS shell as well.

Describing *The Brooklyn Bridge* is somewhat complicated, because there are two variations of the program provided in the same package. These variations offer similar capabilities but use radically different approaches.

One approach is an upgraded version of the original *Brooklyn Bridge*. The core of this approach consists of two sets of files, with specific files needed for transfers over specific ports—COM1, COM2, LPT1, LPT2, and so on. The appropriate file from one set goes on a designated slave machine; the appropriate file from the other set is put on a designated master unit.

Once installed, the program provides an elegant approach to file transfer: All drives on the slave machine are treated as if they were additional drives on the master. You can then transfer files with the COPY command, or even run programs from the slave's hard disk.

Unfortunately, setting up the slave and master requires a sophisticated understanding of CONFIG.SYS files and the files in the program. More troublesome is that this approach won't work if the computers are running different versions of DOS.

The manual claims that, with different DOS versions, the program will prevent any disk access that will corrupt the hard disk. This is one test you don't want to try on your own system.

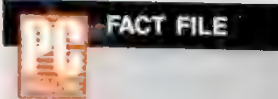
The Brooklyn Bridge's answer to these drawbacks amounts to a second package—a fully integrated, menu-driven program called Filer, which is nearly equivalent to Traveling Software's *Lap-Link*. Odds are that Filer is the only part of *Brooklyn Bridge* you'll ever need.

As you might expect from a program that boasts 175 file-management utilities, Filer can function as a standard file-management program, like *XTree*,

files, either individually or by tagging groups of files. It will let you change logged disks, create and remove directories, print a directory list or a directory tree, change file attributes, and more. One particularly nice feature, a Locate command, will search for a specified file anywhere on the currently logged disk and show you all matches.

Also built into Filer is the ability to shell out to DOS and to define up to five programs that you can run directly from the Filer menu. You can even have Filer automatically pass a filename to a program, so that your word processor, for example, will automatically load the currently highlighted document file. Unfortunately, Filer does not unload from memory when it runs a program. On my system, it left only 327K available.

For transferring files, you connect to a second computer by cable, using either the parallel or the serial cable that comes with the package. You then run Filer on the second machine and designate one computer as the



The Brooklyn Bridge, Version 3.00
Fifth Generation Systems Inc.,
10049 N. Reiger Rd., Baton Rouge, LA 70809-4559; (800) 873-4384, (504) 291-7221.
List Price: \$139.95
Requires: Any two IBM PC-XTs, PC ATs, PS/2s, or compatibles, with a serial or parallel port on both systems; DOS 2.1 or later.
In Short: Actually two packages in one, *The Brooklyn Bridge* offers both a set of DOS utilities and a menu-driven program for sophisticated file management and fast file transfer.

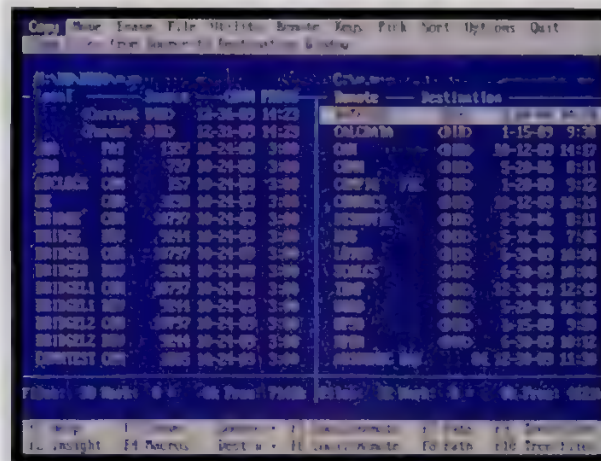
CIRCLE 444 ON READER SERVICE CARD

can't run a program or load a data file from a drive on the slave machine, something you can do using *Brooklyn Bridge's* other approach.

With either approach, you'll generally want to use the parallel connection if there are free parallel ports on both systems. The claimed speeds for file transfer are up to 115,200 bits per second for the serial port and 100,000 to 500,000 bps for the parallel port, "depending on CPU speed." In our informal tests, transfers through the parallel port were about 2.5 times as fast as those through the serial port.

The one advantage to using the serial connection is that you can copy Filer to the second computer using a combination of Filer's Clone command and the DOS MODE and CTTY commands—a neat trick that you'll also find in *Lap-Link III*. However, if you remember to bring a disk with you, it's much easier simply to load the disk on the second computer and run the program. The package comes with both 3.5- and 5.25-inch disks.

In all, Version 3.00 of *The Brooklyn Bridge* is a solid program that stands up well to the competition. Filer by itself provides all the features you're likely to need. And for those who know enough to make use of it, the rest of the package provides additional useful capabilities.



The Brooklyn Bridge's Filer screen lists source files on the left and destination files on the right.

The Norton Commander, or *Lap-Link III*. Like *The Norton Commander* and *Lap-Link*, it splits the screen vertically, so you can see two directories at once. It can also toggle either or both of the screen halves to show directory trees.

Filer uses *Lotus 1-2-3*-like menus to let you copy, move, erase, and otherwise manipulate

slave using a function-key command. The other system becomes the master.

From the master keyboard, you can log onto the slave on either or both halves of the screen. To transfer files, you give the same commands as when copying files between two drives on the same computer. One of Filer's few limitations is that it

Cyrix's FasMath: Faster than an Intel 80387?

HANDS ON
by Robert W. Ames

Advances in PC technology have usually been realized using chips that perform faster and more efficiently than older components yet maintain compatibility with existing standards. NEC started the trend with its V-series 80x86 plug-compatible processors, whose more-efficient microcoding allowed for faster execution of certain instructions than comparable Intel products provide. Along those lines, Cyrix Corp. is looking to become the NEC of math coprocessors.

Cyrix's FasMath 83D87 is a CMOS processor that is pin-compatible with the Intel 80387. Priced at \$925 for the 25-MHz version, the FasMath 83D87 promises a tenfold increase in performance over a standard Intel 80387.



The FasMath 83D87, a high-priced CMOS coprocessor, is pin-compatible with the Intel 80387.

To harness the power of the FasMath, all you need to do is plug it into any socket designed for the 80387. Your system will think it has an 80387 installed, and your software will use the FasMath just as it would the Intel component.

All 117 floating-point instructions found in the Intel 80387 are implemented in the FasMath. In addition, all com-

putations are performed to 91-bit internal accuracy. The FasMath 83D87 also uses less power and dissipates less heat, and thus should be more reliable than the Intel component over the long haul.

What gives the FasMath an edge over the Intel 80387? The main differences between the two are found in their execution speed. While floating-point operations in the 80387 are performed by microcode, the FasMath has the same operations coded into the hardware on the chip, which can result in a tenfold performance increase.

But this performance differential appears only when you compare the actual execution speed of instructions on the chip, since the interface between the 80386 and 80387 wasn't designed to transfer information back and forth that fast. Add to this the fact that some applications are not coded to use the 80387 efficiently, and the optimal tenfold speed increase turns into a neck-and-neck race between the Intel and Cyrix parts.

On informal tests using two applications that don't use the 80387 efficiently—*Lotus 1-2-3* and *AutoCAD*—we saw no difference in performance between the 80387 and the FasMath. A company spokesperson admitted that for these applications, the FasMath offers no appreciable benefit over the Intel.

According to the vendor, *1-2-3* doesn't use the math co-

processor for most floating-point calculations. Therefore, a system that uses either a FasMath or the Intel 80387 will not appear to perform faster than a system that doesn't have a coprocessor. As for *AutoCAD*, most of the floating-point calculations are interspersed among other program instructions. As a result, the FasMath doesn't get used as intensively and doesn't yield an appreciable increase in performance.

Nonetheless, on PC Labs' Floating-Point Calculation benchmark test, the FasMath ran 50 percent faster than an 80387 in a 25-MHz 386 system, showing that the processor will beat an 80387 on some applications. When we ran the vendor-supplied Mandelbrot and Biomorph (fractals) math-processor-intensive tests that come with the FasMath, the processor ran anywhere from 1.6 to 2.4 times as fast as the 80387. On our other informal application tests, the FasMath performed about 3 to 8 percent faster than the 80387.

With mail-order prices of about \$450, the Intel 80387-25 is less than half the cost of the FasMath, which raises the obvious question: Is the FasMath's speed worth the chip's list price of \$745 to \$1,200? If your applications are highly math-coprocessor-dependent, if you want more-accurate floating-point calculations in your custom applications, and if you want a more-reliable part in your system, the FasMath 83D87 bears consideration. ■



FACT FILE

FasMath 83D87

Cyrix Corp., P.O. Box 850118, Richardson, TX 75085; (214) 234-8387.

List Price: FasMath 83D87-20 (20 MHz), \$745; 83D87-25 (25 MHz), \$925; 83D87-33 (33 MHz), \$1,200.

In Short: A CMOS processor that is pin-compatible with the Intel 80387. Promises a tenfold increase in performance over an 80387, which may not be borne out with typical business or CAD applications.

CIRCLE 442 ON READER SERVICE CARD



BENCHMARK TEST: FASMath 83D87-25

The PC Labs benchmark test shows the FasMath 83D87-25 to be 30 percent faster than the Intel 80387 DX-25, but there was no significant speed differential when the two were used with applications such as *Lotus 1-2-3* and *AutoCAD*.

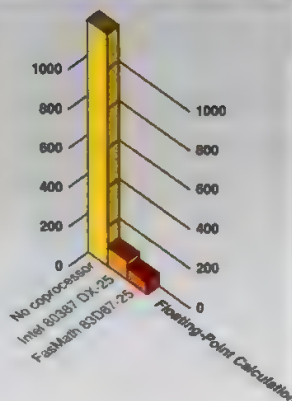
The Floating-Point Calculation benchmark test measures coprocessor speed by looping through a series of floating-point calculations, including multiplication, division, exponentiation, and logarithmic and trigonometric functions. With no coprocessor installed, the same calculations are performed in RAM using a floating-point emulation program.

Performance Times

(Times given in seconds)

	Floating-Point Calculation
No coprocessor	3.90
Intel 80387 DX-25	0.33
FasMath 83D87-25	0.22

The test was performed on a 25-MHz ALR FlexCache 25386.



Relative Times
(Intel 80387 DX-25 = 100)

Floating-Point Calculation

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BestChoice3: Low-Cost Decision Support for Complex Problems

HANDS ON
by Neil J. Rubenking

If you can quantify the elements of a decision into a field of choices, a set of judgment criteria, and a group of decision makers, Sterling Castle's *BestChoice3* can help you do the right thing. The \$99 program breaks down a complicated decision into many small decisions that are easily resolved. Not only that, if anyone challenges such a decision, you can use the program to document the entire process.

A *BestChoice3* decision model is composed of three components: choices, criteria, and people. In most cases the set of choices will be obvious—an employee list, for example. You can enter as many as 255 choices.

Next you list up to 56 criteria on which the choices are to be judged. You can weight the criteria to define their relative importance. A tip from the manual suggests that if you're having trouble assigning weights to the criteria, use *BestChoice3* to rate them on the criterion "Importance."

The model's third element is the group of experts—up to 54 people who will participate in making the decision. You can weight the experts' importance, too, giving greater emphasis to those with more experience. There's no fixed order for entering data. A keystroke brings up any of the data entries at any time, even on top of another

window.

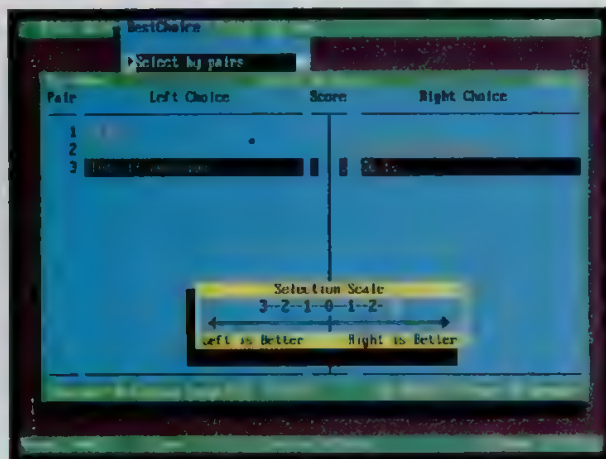
Once you've built the decision model, *BestChoice3* breaks it down into a series of simple two-item comparisons (e.g., "In terms of cost, which is better, a Porsche or a Yugo?"). The minimum number of pairs is the number of choices, and the maximum number is roughly proportional to the square of the number of choices. If you have 255 choices, there are over 32,000 possible pairs. Fortunately, *BestChoice3* claims to make an accurate analysis with

but you can adjust the maximum from 2 to 5.

If you can't get all the decision-making experts to sit down at a single computer or their own PCs and enter their ratings of the pairs of items, *BestChoice3* will print a worksheet showing all the pairs. Each expert only needs to enter ratings on the worksheet and send it back to you for data entry.

When all the experts' ratings are in, you tell *BestChoice3* to evaluate the result. Using a proprietary algorithm, the program

BestChoice3 breaks down a complex decision into a series of simple comparisons involving only two items.



far fewer choices than the maximum. The actual number is user-selectable, and Sterling Castle's statistics show that using 35 percent of the maximum yields an accuracy rate of over 90 percent.

If you've seen the type of questionnaire that asks you to rate statements on a scale from "Strongly disagree" through "Don't care" to "Strongly agree," then you'll find *BestChoice3*'s series of two-item comparisons quite familiar. You simply mark the scale in the middle or toward one of the two choices. The program's default scale runs from 0 in the middle to 3 in both directions,

merges all of the pair-wise comparisons into a single rating that pinpoints the best choice. The output report gives the best choice a rating of 100 percent, and it lists the others in a descending percentage order, reflecting their relative merit. If you prefer, you can tell *BestChoice3* to display the results in a bar chart, though this chart shows only the choice numbers, not the names.

YOU'RE IN CONTROL

If you disagree with the results, you can change the weight of criteria or experts even after you've entered the selection data. The program makes it easy



FACT FILE

BestChoice3

Sterling Castle, 702 Washington St., #174, Marina del Rey, CA 90292; (800) 722-7853, (800) 323-6406 (in Calif.), (213) 306-3020.

List Price: \$99.

Requires: 256K RAM, DOS 2.0 or later.

In Short: A decision-support tool that breaks down a complicated problem into many small problems that are easily resolved.

CIRCLE 433 ON READER SERVICE CARD

to check the effect of assigning more or less weight to a given criterion or expert, and thereby refine your decision model. You can eliminate a criterion or expert from consideration by setting the weight to zero, but you can't add more choices, criteria, or experts. If you need to make additions, you have to clear the selection data, make the change, and then start again.

At the heart of *BestChoice3* are two complex algorithms: a pair generator and an algorithm that evaluates the data. These algorithms are wrapped in a simple and easily learned user interface, complete with windows, pull-down menus, and mouse support. The program's most important functions are instantly accessible by either keyboard or mouse. Each window lists useful keys. There doesn't seem to be much logic in the default placement of the overlapping windows—a tiled layout might have been a better design choice. But navigation between windows is so easy it hardly matters.

BestChoice3 can analyze any quantifiable decision, but it's especially useful when numerous choices and criteria make the problem complicated. When the decision is sensitive, such as firing the five worst employees, *BestChoice3* can provide justification. If a fired employee files a lawsuit or grievance, you can at least present a logical basis for the decision. And if *BestChoice3* saves you from a lawsuit, it will have paid for itself many times over.



"Quicken slashed my tax preparation time and cost by 70%..."

—K.C. Branscomb, President, IntelliCorp

As tax time approached, I used to get this knot in my stomach. I'd dread getting all my receipts and records together for my accountant. I had this nagging fear that I couldn't find all my backup material. But not any more, thanks to Quicken.

It used to take me several weeks to prepare for my taxes. Now, with Quicken, I'm done in a few hours. And since Quicken does all the organization and calculations, pulling together the data for my personal Form 1040 and Schedules A, B, C and D is simple. What's more, my accountant's bill is 70% less because my Quicken records are so complete.

"When I was audited, Quicken saved me."

I used to worry about being audited. When it actually happened, boy was I nervous! Not because I'd done anything wrong, but because I knew I'd need very detailed records. So, I went into the audit armed with Quicken, both in reports and on my laptop. Sure enough, the IRS agent questioned every expense—every trip I took, every hotel room I stayed in. Thanks to Quicken, I responded to each inquiry quickly and easily. My accountant said that being so organized made

all the difference. And when the audit was over, it turned out the IRS owed me money!

"Quicken saves me time all year long."

I used to spend 3 to 4 hours every other Saturday writing checks and doing the books for my home and consulting business. Since discovering Quicken, I get the job done in just 30 minutes. All my frequent transactions are memorized on Quicken, so I just push a button...and Quicken writes, categorizes, and records my payments and deposits. It even prints checks for me. That frees up time for golf, skiing, and friends.

"Quicken automatically organizes personal and small business finances."

Before being president of IntelliCorp, I ran my own consulting business. So, I know how Quicken saves time with both personal and business finances. You just enter transactions, and Quicken automatically puts them in order and does the math. It captures your data in one place, and creates valuable reports like budgets and net worth statements in less than 3 seconds. For small businesses, Quicken creates P&Ls, Cash Flows, Balance Sheets, and other reports.

"I've tried others, but it's Quicken I recommend..."

I tried more expensive packages, but they took too long to get started. Then a friend recommended Quicken. It looks and works just like a paper check-book. Quicken's so easy, I was up and running in 5 minutes—the payback was immediate.

SPECIFICATIONS:

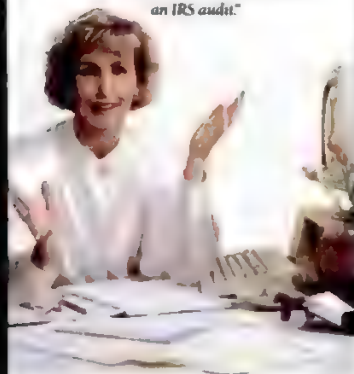
IBM: All IBM PC, XT, AT, PS/2 and compatibles with 120K RAM and DOS 2.0 or higher. Mac: All with 512K RAM. Both versions work with all monitors and printers. Feature sets vary. Balance Sheet report not available for Mac. Unlimited FREE technical support. Not copy-protected.

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- Your own "checkbook" on IBM, Mac, or PC
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- Write checks, pay bills, and record transactions
- Manage all types of accounts: Auto, Savings, Cash, Credit, and Other Assets and Liabilities
- Prepare financial reports: Cash Flow, Profit and Loss, Balance Sheet, Job Profit Report, A/R, A/P, and more
- IBM version exports to ASC II Lotus® Mac to Excel® SYLK Text Hypertext



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K.C. Branscomb



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First Looks

FonTmax Lets WordPerfect Print Foreign and Technical Fonts

HANDS ON

by Edward Merriam

WordPerfect 5.0 knows how to print more than 1,700 characters—but only if your printer has the necessary fonts, which it probably doesn't. ISS Intercontinental Software Systems' \$129.95 *FontMax*, Version 2.0, teaches *WordPerfect* how to print characters and alphabets that *WordPerfect* normally doesn't know about at all. Its fonts work with virtually any laser or dot matrix printer supported by *WordPerfect* and won't interfere with your standard fonts. All characters ap-

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Greek, Hebrew, and Japanese are among the special fonts that *FontMax 2.0* brings to *WordPerfect*.

pear on the normal editing screen if you use a Hercules or EGA/VGA graphics card.

FontMax comes with 18

generally well-designed character sets, ranging from two varieties each of Greek and Hebrew, through Japanese and

Maple: \$695 Math Toolbox Is Worthy Competitor for Mathematica

HANDSON
by Barry Simon

Maple, named after Canada's national symbol, is a math toolbox with symbolic manipulation capabilities. Developed at the University of Waterloo, in the same academic environment that produced the celebrated Watcom compilers, the \$695 program has all the basic features we've come to expect from high-end mathematical packages like *Mathematica* and *PC Macsyma*: it does exact integer and rational arithmetic, handles computations with real numbers to an arbitrary prescribed accuracy, and performs computer algebra and calculus. And like its competitors, *Maple* also makes substantial hardware demands: a 386 machine equipped with a math coprocessor, at least 2MB of RAM, and 4.5MB of hard disk space.

Beyond those similarities, *Maple's* mathematical knowledge is also special in some ways. For example, I was surprised and pleased that it knew that the sum from 1 to infinity of

the inverse squares was π squared over 6. Its symbolic manipulation abilities are comparable to those of *PC Macsyma* and better than those of the current version of *Mathematica*, allowing for more depth in routines. In our informal tests, its numeric speed was only slightly better than that of *Mathematica*.

Maple's user interface looks like the same cryptic command line used by too many other math programs, but with some improvements. For example, you can recall the last 100 commands and edit them or a new command. You can search a command stack for the first command that begins with a given string. Hitting F1 brings up a help menu that calls files into a supplied browser, and an editor allows you to write your own programs. You can easily replace both the editor and browser with your own favorites if you wish.

The program has a tough time handling output that is more than a screen long (because of formatting restrictions, even a 4-by-4 matrix of rational

functions will scroll off the screen). Output longer than a screen is lost and gone forever unless you have your own screen-scroll utility or direct it to a file that you then edit.

Maple's graphics support is disappointing. The program can't handle three-dimensional graphs and can't include legends on two-dimensional ones. Printed output is limited to what you can get with Shift-PrtSc.

There is no hardcover book that describes the functionality of *Maple*, as there is for *Mathematica*. But *Maple*'s excellent tutorial manual and on-line help system make it an easier program to get into than *Mathematica*, for which it is a worthy competitor. ■

List Price: *Maple*, Version 4.3.1, \$695. **Requires:** 386-based computer with 2MB RAM (4MB RAM recommended), 80387 math coprocessor, DOS 3.0 or later. Waterloo Maple Software, 160 Columbia St. West, Unit 2, Waterloo, Ontario N2L 3L3, Canada; (519) 747-2373.

CIRCLE 441 ON READER SERVICE CARD

Russian, and on to electronics, chemistry, borders, miscellaneous business symbols, and a full set of accented characters for use with any western European language. You can automatically enter Hebrew text from right to left, although if you type more than one right-to-left line, each line must be a new paragraph.

Optional character sets, priced at \$12 each, include Armenian, Thai, Turkish, Arabic, Korean, and Farsi. ISS also offers fixed-pitch versions of standard Roman fonts, but you'll be happier with Bitstream's pricier versions.

WordPerfect 5.0 doesn't make it easy to add screen fonts and nonstandard character sets, but *FontTmax* integrates itself reasonably well. You use *FontTmax* by installing a 17K memory-resident program that expands *WordPerfect's* built-in menus with added options that control *FontTmax*. With a Hercules RamFont card, nine *FontTmax* fonts are available at any time; with an EGA/VGA, only two are available. You can insert a few *FontTmax* characters at a time from a full-screen menu, or switch the keyboard so that you enter a *FontTmax* font instead of the normal keyboard characters. Six sizes of each printer font are available, and you can modify *FontTmax* fonts with a separate utility.

Two comparable *WordPerfect* add-ons—MAP Systems' *Lines, Boxes, Etc.* and Image Processing Software's *Turbo-Fonts 512*—have similar functions, but neither matches the print quality or the ease of use of this much-improved version of *FontMax*. A version for *WordPerfect 5.1* is imminent, with a free or low-cost upgrade available for users of the 5.0 version, depending on the date of purchase. ■

List Price: *FontTmax*, Version 2.0, \$129.95. **Requires:** 512K RAM, Hercules Graphics Plus or EGA/VGA graphics card, *WordPerfect* 5.0, DOS 2.0 or later. ISS Intercontinental Software Systems Inc., 390 W. 800 North, #103 and #110, Orem, UT 84057; (801) 222-0909.

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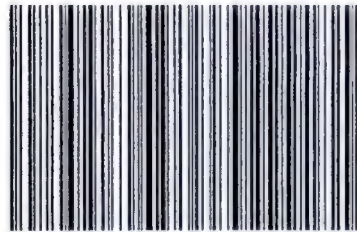
- 4 Megs RAM
- 1.2 Meg 5¼" Drive
- 1.44 Meg 3.5" Drive
- 160 Meg ESDI Drive
- 32K Cache Controller
- 16 Bit VGA with 512K
- 14" 1024 x 768 Color Monitor
- 1 Parallel & 2 Serial Ports
- 101 Key Keyboard
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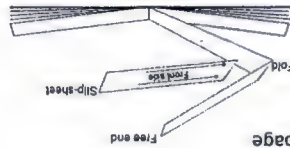
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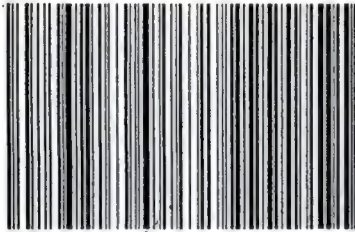
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Back

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First Looks

Resource Toolkit for Windows Lets Programmers, End Users Customize Apps

HANDS ON
by Richard Hale Shaw

Customizing a *Microsoft Windows* application is no worse than customizing an automobile: you can easily change the exterior if you have the right tools. Unfortunately, these tools are usually labeled "For Programmers Only" and require access to the program's source code. Now, both programmers and end users can use The Whitewater Group's *Resource Toolkit for Windows* to customize the appearance of their favorite *Windows* programs.

The \$195 utility lets you modify a *Windows* program's resources: the accelerator keys, dialog boxes, cursors, icons, bitmaps, menus, and message strings. While a program can create these elements at runtime, the program developer usually builds them in advance and stores them in the program itself. There they are arranged by resource type, each with a unique name.

Taking advantage of this method of organization, *Resource Toolkit* lets you manage, manipulate, modify, and move resources from one program to another. Not only can you change resources without recompiling the program, but you can copy them for use in other programs or replace them with your own customized versions.

Since it runs under *Windows*, the *Toolkit* will be easy to use for end users and developers alike: the interface organizes the resources in up to two applications by type and name. You can edit, delete, or move a resource from one program to another with a click of the mouse. The program sports a specific editor for each kind of resource, replete with full-color drawing and filling facilities found in paint programs.

Thus, you can change a program's string table messages to a different language or, to make them more meaningful, modify the icons and cursors or replace them altogether. Moving, resizing, and relabeling buttons in a dialog box is a snap. You can change the default button or remove buttons to prevent access to a specific program feature. Best of all, you can redefine a program's accelerator keys to make them more consistent, convenient, and familiar.

Programmers will find the *Toolkit* editors superior to those found in the *Windows* developers' kits. The editors can align dialog-box objects and display cursor hot spots. The bitmap editor allows you to create full-color bitmaps of unlimited size, and a header file editor lets you manage resource header files.

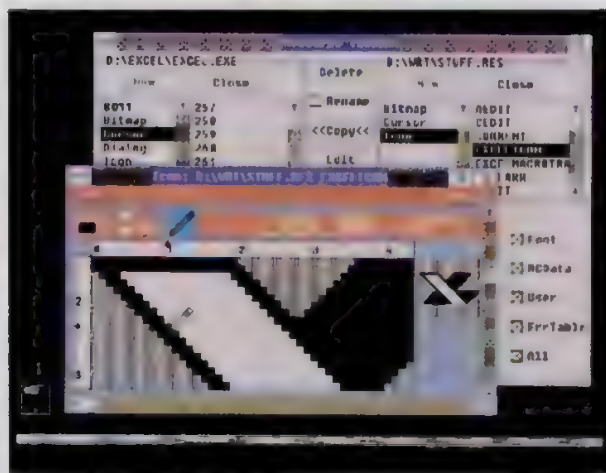
Limitations? There are only a few. If you are using *Windows/386*, you'll have to use a memory manager or run *Windows* in 286 mode. In ordinary use, *Windows/386* doesn't offer enough memory, and the *Toolkit* uses too much. In 286 mode, the program runs just fine.

Resource Toolkit for Windows is a truly impressive utility that no serious *Windows* developer should be without. *Win-*

dows end users should also take note: if you've ever wanted to customize your favorite *Windows* program, this is your chance.

List Price: *Resource Toolkit for Windows*, \$195. **Requires:** *Microsoft Windows/286* or *Windows/386*. The Whitewater Group Inc., 600 Davis St., Evanston, IL 60201; (312) 491-2370.

CIRCLE 430 ON READER SERVICE CARD



The icon editor of *Resource Toolkit for Windows* can be used to modify the look of *Windows* applications.

Eye Relief Brings Large Fonts to Laptop Users and The Visually Impaired

HANDS ON
by Bill Howard

If you have trouble reading the display on your laptop or portable PC because the characters are so small and the screen is so poor, you could be a candidate for *Eye Relief*, the \$295 large-type word processor from SkiSoft. What you need to know about *Eye Relief* can be said in seven words: big type, big price, small features list.

Targeted at laptop users and the visually impaired, *Eye Relief* provides six screen fonts that range from about 20 lines by 80 characters (a font called Tiny) through 4 lines by 20 characters (Jumbo). CGA adapters provide slightly bigger characters than EGA, VGA, and Hercules adapters. You can

fine-tune the spacing between letters and lines, so that your preferred setting for Tiny might yield 12 lines by 60 characters.

What *Eye Relief* does, it does well. On a laptop, the smallest font appears to be about twice as legible as the standard 25-row-by-80-character display of a character-based word processor.

The three larger fonts, whose names sound as if they came off detergent boxes, are designed for users with vision problems. Jumbo text stands an inch high on a 13-inch desktop monitor—five to six times the size of standard characters.

Eye Relief lets you count the number of words in a document; set margins, headers, and footers at print time; and, with a laser printer, produce 18-point

monospace type in addition to Courier. But that's about as far as the features list goes. There's no boldface, no underlining, no tabs (you press the Spacebar five times to start a paragraph), and don't even think about a spelling checker or double-spaced printouts. To use *Eye Relief* as the laptop companion for your desktop word processor, you must strip the file to bare ASCII.

Given the number of PC users who are visually impaired, plus the far greater number whose vision simply isn't what it used to be—or whose laptop display isn't what it ought to be—there should be strong demand for full-function, large-type software. *Eye Relief* may not be ideal, but it is a useful first step.

List Price: *Eye Relief*, \$295. **Requires:** 512K RAM, graphics display. SkiSoft Inc., 1644 Massachusetts Ave., Lexington, MA 02173; (617) 863-1876.

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CIRCLE 205 ON READER SERVICE CARD

by
Alan Cohen

New & Improved

News of Announced Products and Upgrades

VP to the Max Tools Aid Ventura Publisher Users

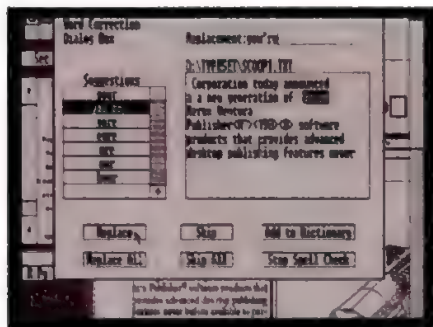
NEW

Adding a few new tools to *Ventura Publisher's* standard bag of tricks, *VP to the Max*, from *Aristocad*, gives the popular desktop publishing package a spelling checker, a thesaurus, a search-and-replace feature, and a style-sheet-viewing capability.

The \$200 program's electronic dictionary contains over 100,000 words, including technical, scientific, legal, and geographical terms. Working directly within *Ventura*, the spelling checker verifies the spelling accuracy of all .TXT and .CAP files associated with an entire *Ventura* chapter file. Users can also add up to 100 custom dictionaries.

The built-in thesaurus, which also operates directly within *Ventura*, automatically adjusts words to the proper tense or number, and the search-and-replace feature automates universal text editing by having the system (and not the user) scan the entire chapter file. At each mention of a particular word, that word is automatically replaced with the desired substitute.

The fourth accessory, the style-sheet-viewing utility, allows users to view the lay-



VP to the Max's spelling checker, among other tools, enhances *Ventura Publisher*.

out, alignment, fonts, margins, and columns of a selected style sheet.

List Price: *VP to the Max*, \$199. **Requires:** *Ventura Publisher*. Aristocad Inc., 1650 Centre Pointe Dr., Milpitas, CA 95035; (408) 946-2747.

CIRCLE 435 ON READER SERVICE CARD

HOT PROSPECT

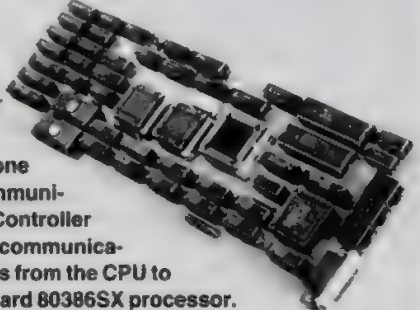
COMPUTONE INTRODUCES BUS-MASTERING EISA COMMUNICATIONS SUBSYSTEM

The Computone ALC Communications Controller, from **Computone Products**, is a 32-bit bus-mastering communications system for machines that adhere to the EISA-bus specification. Featuring an 80386SX-based communications controller board and four optional add-on modules, the Computone ALC offers EISA-based systems asynchronous, synchronous, Ethernet, fax, and scanner capabilities. Because the modules plug into the controller board, only one PC slot is necessary.

Other modules are expected to ship in the near future (up to four modules can be installed on the board at any one time). The system is available with device drivers for SCO Unix System, Version 3.2; SCO TCP/IP; and SCO Open Desktop. Drivers are in development for SCO Xenix; AT&T Unix System, Version 3.2; Interactive 386/ix; and Unix System, Version 4.0.

List Price: Computone ALC Communications Controller, \$1,595; Async Feature Module, \$1,195; Ethernet Feature Module, \$695; Async/Sync Feature Module, Fax Scanner Feature Module, Prices TBA. Computone Products, 1100 Northmeadow Pkwy., #150, Roswell, GA 30076; (800) 241-3946, (404) 475-2725.

CIRCLE 434 ON READER SERVICE CARD



The Computone ALC Communications Controller offloads communications jobs from the CPU to an on-board 80386SX processor.

RoundTrip Automatically Creates Worksheets

NEW

RoundTrip, a new worksheet-building tool from **Circle Systems**, can automatically generate complete *Lotus 1-2-3* spreadsheets. Using a fourth-generation language, users specify the "pattern" of the spreadsheet—where fields should go, where totals should be, what formulas should be used—and the program then generates a ready-to-go worksheet.

RoundTrip can also update and extract data from existing worksheets. The program also has the ability to sort, select, aggregate, and consolidate data from one or more worksheets.

The input data incorporated into the generated worksheets may come from ASCII fixed-format or delimited files, report files, *dBASE* files, or worksheets. *RoundTrip* is compatible with all versions of *1-2-3* through Release

2.2. (A version of *RoundTrip* compatible with *1-2-3*, Release 3.0, is now in development.) The program also works with *Symphony* files (all versions) and with *dBASE III, III Plus, IV*, and compatibles.

List Price: *RoundTrip*, \$695. **Requires:** 256K RAM, DOS 2.0 or later. Hard disk recommended. Circle Systems, 1001 Fourth Ave., #3200, Seattle, WA 98154; (206) 682-3783.

CIRCLE 436 ON READER SERVICE CARD

FontSpace Compresses LaserJet Fonts

NEW

FontSpace, a new TSR program, can compress font files for LaserJet printers by up to 98 percent, according to **Isogon Corp.**, which markets the \$89.95 package.

Font files stored on-disk are automatically compressed when the program is first in-

CONTINUES ON PAGE 54

New & Improved

FontSpace

CONTINUED FROM PAGE 63

installed. Then, when a set of fonts used within a specific application program needs to be loaded, the fonts are automatically expanded by *FontSpace*. New font files created by the user are also compressed and expanded automatically.

FontSpace works with all fonts compatible with the LaserJet Plus, LaserJet Series II.



FontSpace scans through your hard disk, automatically compressing font files.

and LaserJet IID. A new release of the program, expected to ship early in 1990, will also support LaserJet IIP-format font files.

List Price: *FontSpace*, \$89.95. **Requires:** 20K (3K if EMS is available), hard disk, DOS 3.0 or later. Isogon Corp., 330 Seventh Ave., New York, NY 10001: (212) 967-2424.

CIRCLE 437 ON READER SERVICE CARD

Point-and-Shoot Bookkeeping From Accounting By Design

NEW

Intended for the small business, *Bookkeeping by Design*, from Accounting by Design takes advantage of the Microsoft Windows environment for its integrated accounting package. Featuring accounts payable, accounts receivable, and general ledger modules, *Bookkeeping by Design* provides users with a report writer and invoicing and payroll systems, as well. The package also supports sideways printing and access to soft fonts.

A key feature of the program is its ability to process actions in the background while another *Windows* application is running in the foreground. However, while the package includes a runtime version of *Windows*, the full retail version is needed to access this feature. **List Price:** *Bookkeeping by Design*, \$695.

Date	Check	Amount	Debit	Credit	Description
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1-15-89	100	500	990.26		Buy of Machines, Inc.
		120		994.25	Zone on 1200
1-10-89	127	800	1,556.00		Thompson's Inc

Bookkeeping by Design lets you preview all reports on-screen.

Requires: 640K RAM, hard disk, graphics adapter, mouse, any printer supported by *Microsoft Windows*, DOS 3.1 or later.

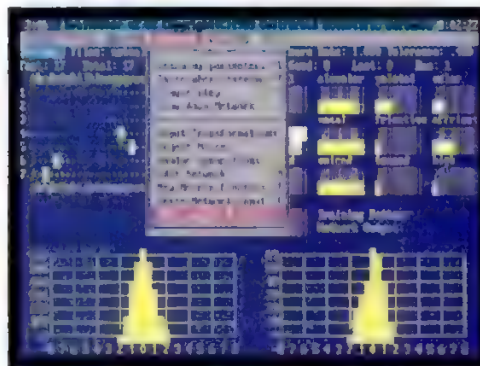
Accounting by Design, 2140 Shattuck Ave., #501, Berkeley, CA 94704; (800) 548-9179, (415) 845-4716.

CIRCLE 428 ON READER SERVICE CARD

IMPROVED

CASE:PM for C, Version 2.0—Caseworks' enhanced release of its application-development system for Presentation Manager is available in two versions—one with a closed knowledge base, the other with an open one. The open knowledge base allows developers to access Caseworks' Software Engineering Language (SEL) to incorporate their own instructions, rules, and procedures into the Caseworks PM knowledge base. To help users modify the knowledge base, *CASE:PM for C, Version 2.0*, features annotated knowledgebase files and documentation regarding the SEL. The package also supports multiple, overlapped, and tiled child windows, as well as bitmaps and menu items. The open knowledge base version of the package retails for \$3,995; the closed knowledge base version is available for \$1,995. Owners of *CASE:PM for C, Version 1.0*, can upgrade to either of the new releases for 25 percent of the list price. Caseworks Inc., Atlanta, Ga.; (404) 399-6236.

BrainMaker, Version 2.0—An upgraded version of the neural network simulator package from California Scientific Software includes the following: NetMaker, a network generation and data manipulation program with a spreadsheet-style display and the ability to perform arithmetic operations on data; support for graphics post-processing of network results; the ability to read from Lotus 1-2-3, dBASE, Quattro, and Microsoft Excel files; automatic numeric translation; new commands to read and edit the connection-strength matrices; the ability to connect fact files logically to create large databases; support of EGA 4 print inputs and network outputs displayed on screen. Price: \$195. Registered owners of Version 1.0 can purchase Version 2.0 for \$145. California Scientific Software, Sierra Madre, Calif. 91764.



One of *BrainMaker's* new features is the ability to edit the weight matrix.

Freedom of Press Professional—For users with advanced imaging requirements, Custom Applications has released an enhanced version of *Freedom of Press*, its software-based PostScript interpreter. The new release, *Freedom of Press Professional*, features support for TIFF, TARGA, and raw raster formats (at resolutions ranging from 36 to 5,000 dots per inch) and includes drivers for all of the devices supported by the original *Freedom*

CONTINUES ON PAGE 56

Caere's OmniPage Add-ons Ease OCR Cleanup

NEW

A series of add-on products now available from **Caere Corp.** integrate with *OmniPage*, Version 2.1, to help users proofread and check spelling in documents translated with that program, as well as add dot matrix recognition capabilities.

OmniSpell is a spelling checker that features a 100,000-word American English dictionary, as well as legal and medical dictionaries. According to the company, *OmniSpell* can correct optical character recognition errors (suggesting a new word where *q* has been replaced by *g*, for example).

OmniProof, which operates as a stand-alone package, matches any two word pro-

CONTINUES ON PAGE 59



THE BALANCE OF POWER: QUATTRO® PRO

	QUATTRO PRO*	Lotus 1-2-3® v 2.2 v 3.0	
PUBLISHING			
3-D Graphs	✓		
Built-in draw package	✓		
Individual cell font control	✓	✓	
Shading and borders	✓	✓	
Print graphs & spreadsheets side-by-side	✓	✓	
CONSOLIDATION			
Multiple spreadsheet windows	✓		✓
Multipage consolidation	✓		✓
Keyboard and mouse support	✓		
Lotus 1-2-3 v 2.01 compatibility	✓	✓	✓
Spreadsheet Capacity (NSTL) **	640K RAM 11 1Mb RAM 18	8 12	NA 5
Price***	\$495	\$495	\$495

*Clip art from PicturePaits™ by Marketing Graphics Inc. (MGI)**NSTL (National Software Testing Labs) measured spreadsheet capacity by counting how many years of data could be added to a spreadsheet. Large numbers mean greater capacity. Performance for v 2.2 is with Always attached.
***Based on suggested retail prices as of October, 1989.

"QUATTRO PRO seems to do the impossible: It maintains compatibility with 1-2-3; adds functionality that no version of 1-2-3 has and still runs large spreadsheets in 640K."

PC WEEK, September 4, 1989

"Borland squeezes such features as multipage consolidation, advanced linking, and live graphics into a package that runs on 512K systems with its Virtual Real-Time Object-Oriented Memory Manager (VROOMM™) technology."

InfoWorld, September 4, 1989

QUATTRO PRO, with a unique balance of power, does both advanced publishing and multipage consolidation.

Lotus 1-2-3's Release 2.2 cannot do both. Neither can their Release 3.0 (see comparison chart).

QUATTRO PRO is compatible with 1-2-3.* It comes with a built-in draw package, clip art library,* and Bitstream® typefaces for presentation-quality output.

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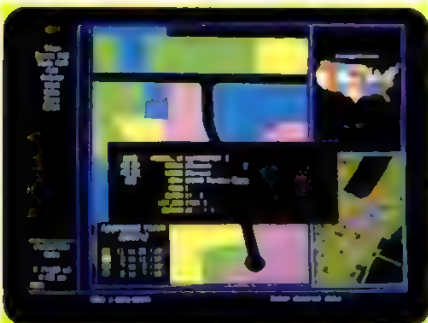
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CIRCLE 377 ON READER SERVICE CARD

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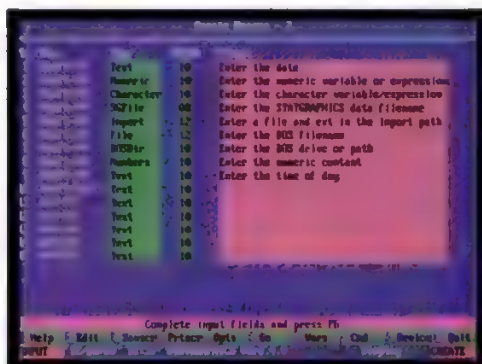
IMPROVED

CONTINUED FROM PAGE 54

of Press package. In addition, the new release also supports drivers for high-end output devices (including the Iris Graphics continuous-tone printer) not supported by the original package. *Freedom of Press Professional* also supports Adobe Type 1 fonts and utilizes the 32-bit protected mode of the 80386 processor to create high-resolution color raster images quickly; these images can either be used to drive imaging devices or be stored to disk as a file. *Freedom of Press Professional* retails for \$1,495. A driver for the Iris Graphics Series 3000 continuous-tone color ink jet printer is available for an additional \$1,495. Custom Applications Inc., Billerica, Mass.; (800) 873-4367, (508) 667-8585.

PicturePower, Version 3.1—Featuring support for 8514/A and Super VGA graphics boards, Version 3.1 of *PicturePower* is an improved edition of PictureWare's image database software. The new release, which allows images to be captured via video camera and placed in databases and applications along with text, features an expanded internal database-management system and works with *dBASE III Plus*-compatible files. Version 3.1 also supports the Kodak SV6500 Color Video Printer and the Jovian Sylvia image-capture board. *PicturePower*, Version 3.1, retails for \$1,995. Current owners should contact the company for upgrade details. A version of the software suitable for use on a LAN is also available, for \$2,995. *PicturePower-HC*, which consists of the new *PicturePower* plus a hardware compression board—to reduce storage requirements of Super VGA images while improving transmission times—retails for \$3,900. PictureWare Inc., Bala Cynwyd, Penn.; (215) 667-0880.

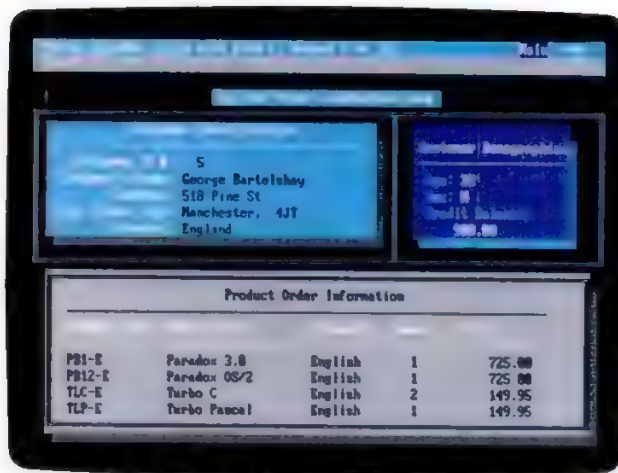
Statgraphics, Version 4.0—The latest version of STSC's statistical graphics system features macro support and up to 20 user-programmable hotkeys. The package also supports EMS and XMS memory-management software, and a new graphics driver allows users to change graphics settings quickly or to switch devices without rebooting. A driver for the HP PaintJet printer is also included, and drivers for IBM Proprietary, Calcomp plotters, and Okidata 290-series printers are available separately. Furthermore, error bars can now be displayed on bar charts, enhanced plot options and greater control over x-axis labels are provided, and ASCII files that use a delimiter other than a comma or a blank may be imported. An improved EVAL operator is included in the package, as is a new FFT procedure. International versions of *Statgraphics*, Version 4.0, support French, German, and Swedish character sets. The new release retails for \$895. Registered owners of previous versions should contact the company for upgrade details. STSC Inc., Rockville, Md.; (800) 592-0050, (301) 984-5123.



The latest release of *Statgraphics* allows for up to 20 user-created hotkeys.

WorldPort 2496i-T Fax/Data Modem—An internal modem specifically designed for use in Toshiba laptop computers, the WorldPort 2496i-T Fax/Data Modem, from Touchbase Systems, features both a 9,600-bit-per-second Group III fax and a 2,400-bps data modem in one integrated package. According to the company, users have full fax capabilities, including unattended reception and transmission, group broadcasts, delayed transmission, and manual operation. The unit also features automatic detection and routing of an incoming call to the fax or data portion of the software. Furthermore, both a standard telephone jack for direct connection and an additional interface for acoustic coupler operation are provided. The WorldPort 2496i-T retails for \$699. An external, battery-powered version is also available at the same price. Touchbase Systems Inc., Northport, N.Y.; (516) 261-0423.

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Paradox has become the leading networker because it handles multiple users intelligently. If someone in your group or network has accessed a record, automatic record-locking keeps everyone else from changing it.

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CIRCLE 147 ON READER SERVICE CARD

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And PreScript runs up to five times *faster* than other solutions, particularly for graphics intensive pages and pages that switch fonts frequently. For even faster printing, an optional

PreScript interface card is available for use with the LaserJet Series II.

Plus, you get unlimited scalable, rotatable fonts along with all of the PostScript special effects, including support for powerful grey scale generation, character path, complex clipping, arbitrary image scaling and rotation, and curve drawing with flatness control.

PreScript requires no expensive printer controller. No extra printer memory. No external drivers. No soft fonts or font cartridges. No hidden costs.

So make your LaserJet take off for pennies. Power up with PreScript: 13 fonts (\$195); 35 fonts (\$395); optional interface card (\$295).

System requirements: 286 or 386™ PC with 2 MB of extended memory; DOS 3.1 or higher; PreScript also works with the HP DeskJet and other HP-PCL compatible printers. **CIRCLE 342 ON READER SERVICE CARD**

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or write:

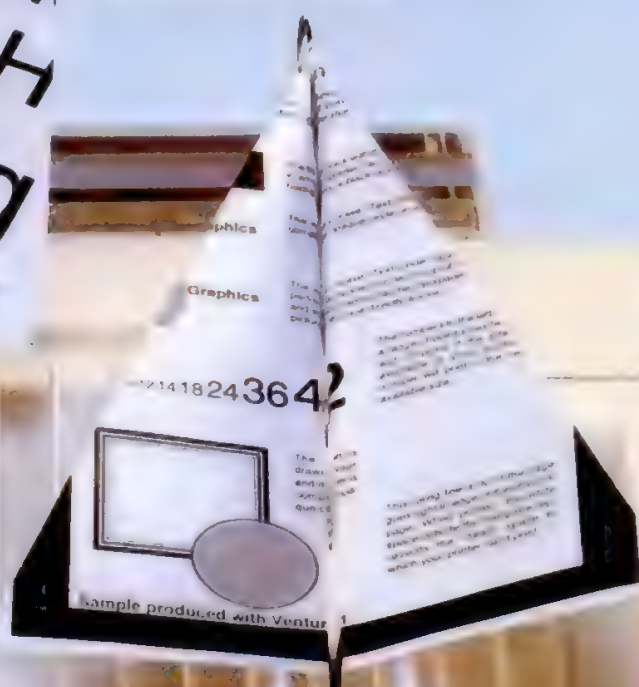
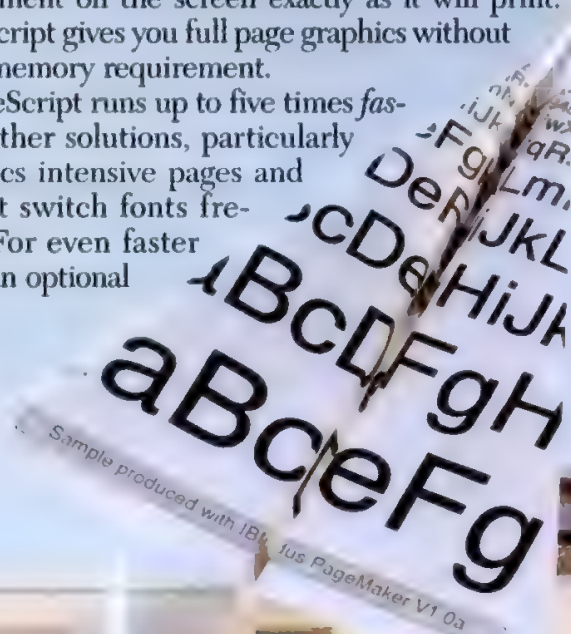
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OmniPage Add-ons

CONTINUED FROM PAGE 54

cessing files and identifies all formatting and text differences between the two documents. The changes can be viewed in the two side-by-side windows displayed on-screen, and a list of all changes made to either document can be generated.

In addition, *OmniDraft* allows *OmniPage* 2.1 to recognize scanned draft-mode dot matrix text. Text can range in size from 8 to 72 points, in either portrait or landscape orientation. A standalone product, *OmniTrace*, converts bitmapped images to encapsulated PostScript format and includes a set of editing tools.

List Price: *OmniSpell* and *OmniDraft*, \$100 each; *OmniProof* and *OmniTrace*, \$150 each. **Requires:** *OmniSpell* and *OmniDraft* require *OmniPage*, Version 2.1. Caere Corp., 100 Cooper Ct., Los Gatos, CA 95030; (408) 395-7000.

CIRCLE 439 ON READER SERVICE CARD

FlashFax Fulfills Literature Requests via Fax

NEW

Thanks to the fax machine, the days of the self-addressed stamped envelope may be rapidly winding down, and FlashFax, an integrated fax board and voice response system from Brooktrout Technology, may hasten its demise.

FlashFax allows users of touch-tone phones to request and receive documents via fax transmission. For example, a person wishing to request product literature or a price list would call a company's FlashFax system and use the phone's keypad to select a specific document. The document would then be automatically faxed to the caller.

The system's administrator can record a greeting message and a document list, documents can be entered into the system via any fax machine, and all requests for documents are recorded to disk to monitor the system's activity.

FlashFax is built around an AT-compatible system with a 20MB hard disk, a Brooktrout TR-111M fax card, a Brooktrout TR-100M3 voice processing card, a 1,200-bit-per-second modem, and the necessary software.

List Price: FlashFax, \$5,995. Brooktrout Technology Inc., 110 Cedar St., Wellesley Hills, MA 02181; (617) 235-3026.

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With The Bread Board System (*tbbs*) Information Manager you can allow up to 32 users to simultaneously access electronic mail, custom databases, or transfer files.

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Your memory isn't what it used to be.

There are so many demanding applications, so few adequate memory boards and so much hoopla attending it all, that you're not alone if you're confused. Here, then, are a few facts to help you make up your mind.

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applications your memory board will support today and how compatible it will be with future advances in hardware and systems.

Intel's Above Board, we're pleased to say, supports more applications than anybody. Whatever fancy software you want to run today—advanced graphics, 3-dimensional spreadsheets, multitasking, or OS/2—you can. And because Intel developed expanded memory and continues to work with pace-setters like Microsoft and Lotus, you'll stay compatible in the future.

The second most important thing is reliability. That's a bit more subjective, but seven out of ten people who buy expanded memory buy Above Board. And then, having used it, they consistently rate it first in reliability and compatibility in poll after poll in *PC Week* and *PC World*.

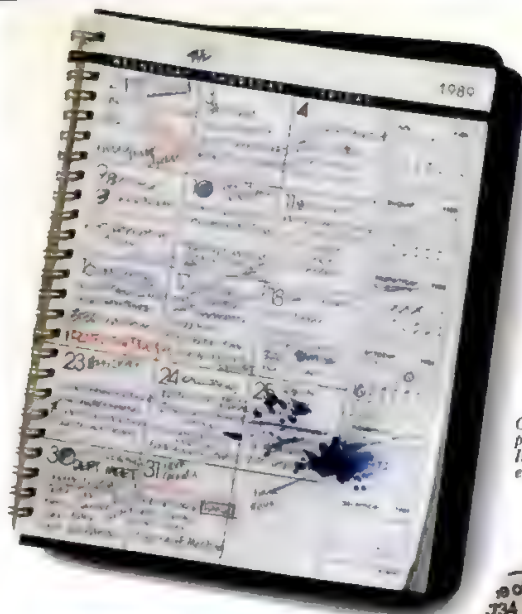
Third, look for service. Each Above Board comes with an industry-leading, five-year warranty and a toll-free hot line to the best technical support staff around, bar none. Even the competition admits that.

Those are the facts. For more about differing memory technologies demanded by applications today and tomorrow, please ask for our white paper on the subject. Dial our 24-hour automated FaxBack line, (503)629-7576, and request document #9951, or call Intel directly at (800)538-3373.

You'll forget you ever had a memory problem.



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We can make child's play out of finding and working with files on Novell or IBM Token Ring Networks



A new vision of utilities.

Central Point Software's vision is that a utility product should enhance your productivity every moment you're at the keyboard. Not just simply recover a deleted file or backup your hard disk like the others.

That's why we developed PC Tools Deluxe, a whole new approach to what a utility product should be. It not only protects you from misfortune by providing you the most common "standard" utility functions available, but it also includes features to simplify everyday tasks. Like allow you to find, preview and load a 1-2-3 spreadsheet. Make it easy to combine the contents of one document into another. Even allow you to look up a client's address while you're in the middle of another application.

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PC Tools Deluxe 5.5

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Users of versions prior to 5.5, call (503) 690-8090 for upgrade details.

by
Gus Venditto

Pipeline

A Look at the Trends Shaping the Personal Computer Market

486 Debugging Believed Over; Shipments to PC Makers and Experiments with 860 Begin

Intel is finally breathing easier now that it's confident it's gotten the last bugs out of the 486. In December, a corrected version of the chip was shipped to key customers.

That means PC makers will only now be turning up the steam on their 486-system assembly lines. By spring, 486 PCs should

be widely available.

A few vendors were able to devise software and hardware workarounds for the bugs, so a limited number of machines built on the unfinished chips may be on the market. IBM has said it will correct any problems its Power Platform/486 customers find in the few boards that were shipped

last fall, but it hasn't yet said whether that means boards will be replaced or software fixes will be provided. See the December 22, 1989, Pipeline for details on the problems with early versions of the chip.

Meanwhile, system development work on the other brand-new explosive processor from Intel, the 860, is starting to get serious.

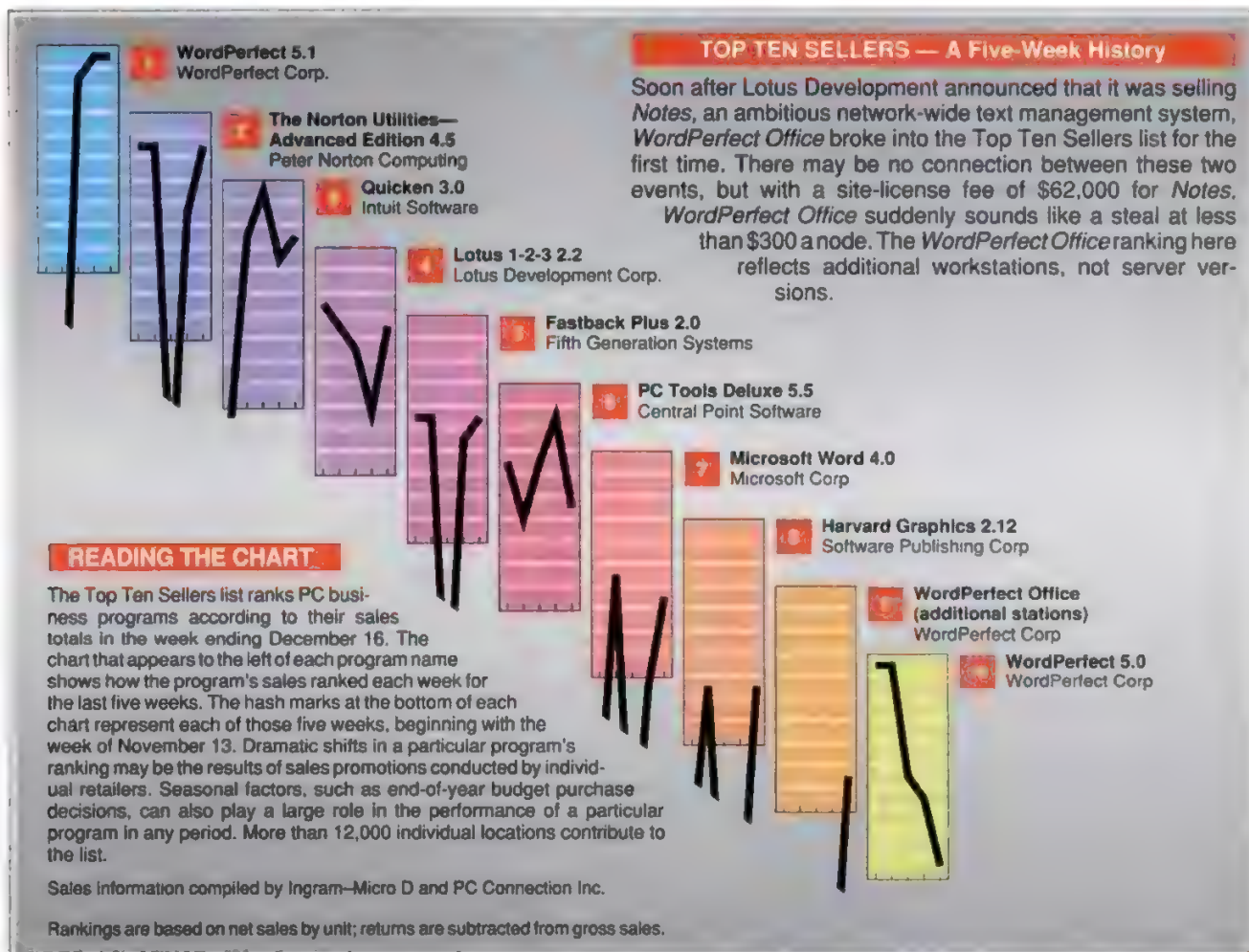
The 33-MHz 860 is powerful enough to be the brains of a hot new workstation, but the first implementations are tapping it as a 3-D graphics and floating-

point computational processing unit within 386- and 486-based machines.

IBM has designed the Wizard, an MCA card with an 860 and 2MB of DRAM, which will allow computations to be off-loaded from a Model 70's or Model 80's main processor.

Hauppauge Computer Works, a small Commack, New York, company founded by two Intel renegades, has devised an EISA-bus system board with symmetrical dual access to both a 486 and an 860 processor. PC com-

CONTINUES ON PAGE 64



Pipeline

CONTINUED FROM PAGE 63

patibility is ensured by use of Chips and Technologies' original AT chip set, and 36-bit IBM SIMMs are employed to provide full 32-bit memory accesses (four parity bits are maintained for each 32-bit access).

With strong vector-processing performance (25 times that of the 486), an 860 makes an ideal graphics coprocessor. It's also a heavy-duty computational engine, since it contains two floating-point units in addition to the integer cruncher in the main processing unit, and it executes instructions in parallel. The 860 could be programmed to generate three results every processing cycle, though this is not a common scenario.

To help keep 860 developers on the same track, Intel has provided system engineers with Host Link, a protocol for addressing the 860. Programmers who conform to Host Link should be confident that their applications will run on an 860, no matter how it's used in a system's architecture.

Early prices make it clear that these are high-end tools. IBM's charging \$7,000 for its Wizard board, and Hauppauge is asking \$7,500 for a system board alone (no disk drives, video board, or power supply).

And until there's strong software support, the 860 won't be moving at all. That support could come soon, though. Strong rumors are circulating that some of Microsoft's key operating-system programmers are creating the framework for transferring OS/2 to the 860.

Soviet Union Gets First Regular Supplies of PC Software

Currency restrictions still stand between the technology-starved Soviet population and thousands of PC products, but a few pioneers are trying to carve out the first pieces of that vast market.

This month, Moscow is getting its first Computerland. Right now, U.S. export restrictions prevent any PC more powerful than a 16-MHz 286 from being

exported to the Soviet Union, but that leaves plenty of 8088 and 286 machines eligible for export.

The store will be stocking a variety of AST and Epson PCs, plus whatever software programs the Russians are interested in buying.

Meanwhile, *Open Access 2.13* will become the first software program to have a marketing distribution agreement for the U.S.S.R. The Soviet Academy of Sciences, in conjunction with Software Products International, has translated the integrated program and will start to sell the Russian version throughout the country.

As part of the agreement, SPI will try to market any of the Academy's Russian programs that SPI thinks would appeal to either Americans or Europeans.

Spectrum
Holobyte has had wild success with *Tetris*, a game written by two Soviets that the company adapted and distributed here, first on the PC and now in Nintendo cartridges.

There are still serious currency obstacles preventing a free exchange of software. SPI will not be able to take its earnings for *Open Access 2.13* out of the Soviet Union. It's willing to take a long view that eventually the rubles it accumulates in the Soviet Union will prove valuable to the American corporation.

The Computerland store, which is being operated by a New Jersey franchisee, is more fortunate. It's being operated under the umbrella of a free-trade zone that allows the Americans to transfer funds out of Moscow.

The idea of Soviet software ever being successful may sound unlikely—unless you've ever played *Tetris*. It's one of the most ingenious games ever devised for computers—thoroughly logical and completely original.

Sound Effects Becoming Standard on Games

PC-based games have always taken advantage of improving graphics standards, but in the last year, designers have started to use sound options to add drama to games.

According to *PC Magazine's* After Hours editor, Jonathan Matzkin, the Ad Lib board and Roland's MT-32 synthesizer module have become the standards that games programmers write to, offering two clear budget choices.

The \$200 Ad Lib board offers eight FM-synthesis voices. While the sound is not as good as a state-of-the-art synthesizer, the Ad Lib nevertheless vastly improves on the bleats and beeps that come from the PC's tinny speaker. Taito Software's *Arkanoïd II*, an arcade game, makes excellent use of the Ad Lib board for both music and sound effects.

At about \$800, Roland's MT-32 is far more powerful. It's supported by Sierra On-Line's fantasy adventure games, among other recreational software. The sounds—many of them digitally sampled—are rich, full, and varied. Games like Sierra's *Space Quest III—The Pirates of Pestulon* boast complete, original scores that make full use of the MT-32's resources.

Later this year, Lucasfilm Games (the computer division of George Lucas's film studio) will bring out *Loom*, an eagerly anticipated puzzle that is expected to do for weaving what the Mario Brothers did for climbing. It will make dramatic use of Roland's MT-32.

Access Software has taken a different route to improved sonic output for games like *World Class Leader Board* and *Mean Streets*, which the company describes as an "interactive movie." Access has developed a proprietary

process, called Real Sound, that coaxes not only music but also intelligible voices from the PC's speaker. At least one other company has already licensed the technology, which adds depth and realism to PC games without requiring a cash outlay for additional hardware.

IBM's Audio Visual Connection is a potential new standard for recreational software. The audio-only board costs about \$600 or so and has capability for full-voice recording or for stereo music.

The right features aren't enough to garner software support, however. Tandy's 1000TL, introduced a couple of years ago, has the sound-sampling and playback features that could turn it into a spectacular entertainment machine. Unfortunately, none of the games available are written to the Tandy spec.

Virus Updates Posted on New BBS

As certain as death and taxes in the '90s are virus software scares.

Foolish rumors have already started circulating about a New Year's 2000 Trojan horse that could greet PC users on January 1, 2000.

Accurate information may be the best weapon you can have against terror-seeking hackers.

A new bulletin board has been started in Washington, D.C., to disseminate news and antivirus programs. It's run by a fledgling outfit, the National Computer Security Association, and operates at 1,200 and 2,400 bits per second (8N1); call (202) 364-1304, 24 hours a day.

An annual membership costs \$45 and entitles you to full access to the board.

Some of the most effective protective software has been shareware specifically written to counter a known virus. These programs are generally available on the NCSA's bulletin board or on PC MagNet.

MagNet occasionally posts virus-fighting programs if they're discussed on the system's forums, but NCSA, being dedicated to security, stays on top of virus trends. For instance, within days of the discovery of the AIDS virus, NCSA had a program to detect and remove it. ■

This month,
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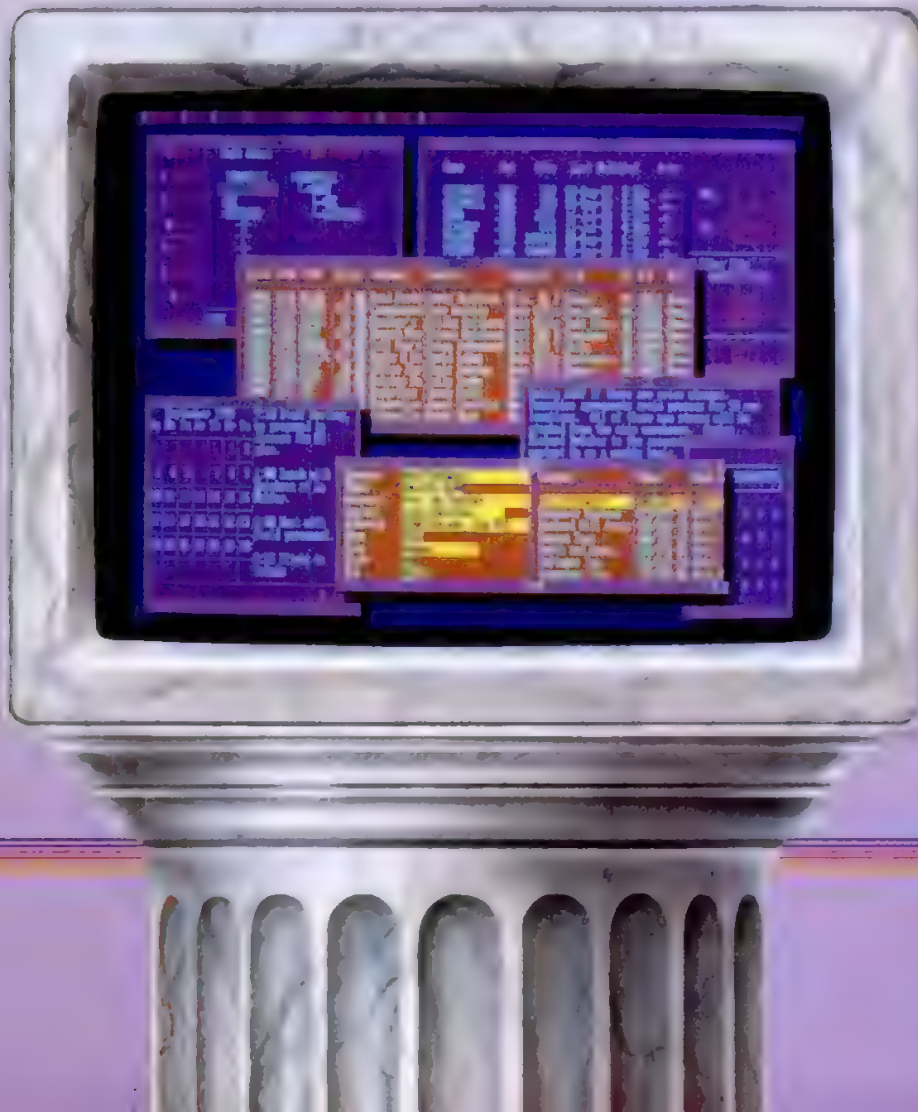
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CIRCLE 112 ON READER SERVICE CARD



Bill Machrone



Hucksterism and hype are invading every nook and cranny of our daily lives. We must stand up against companies that treat your PC's screen like a television set.

Commercialism is rampant in places where we've never seen it before. Anyone with children is all too familiar with the tie-ins of action figures, TV shows, and feature-length animated films. Comic book characters now use and talk about commercial products, and some plots revolve entirely around new toys. Archie and Jughead no longer commiserate about their flagging algebra grades down at the malt shop. Instead they enthuse over their swell Kyosho radio-controlled cars. Nintendo games now have sports stars using brand-name products such as tennis rackets. Product names and logos even appear in the back-grounds of arenas and stadiums. It's just a matter of time before we're completely saturated.

"So what," you might say. "It's only a game." Sure, if that's where it stopped. But times have changed. I can remember movies in which actors drank from generic beer cans. On many an album cover, the singer's hand was casually draped over the guitar's head so as not to advocate one brand over another. Nowadays, commercial considerations are a major part of making a movie. Everyone has heard the story of how M&M Mars turned up its nose at ET, leaving the way clear for Hershey's Reese's Pieces to entice the lovable little monster into Elliot's room.

We've even been approached here at *PC Magazine*. Some movie mogul wanted his tape-on-the-glasses nerd to be reading our mag in one of the scenes. The point of the scene was that the guy was a jerk, and the magazine was supposed to be there as an outward and visible sign of his jerkiness. Needless to say, we turned it down.

For marketers of consumer products, the common enemy is clutter. Many nearly indistinguishable products vie for your attention in magazines, on television, billboards, and store shelves. Consumer products are sold on the basis of brand name and brand recognition, unlike technical products such as PCs, which are sold on the basis of feature comparison, price/performance, and technical merit.

Simply as a purchaser of PCs, you are interesting to mass marketers. *PC Magazine* readers have managerial jobs, high family

incomes, and a lot of education. You're an ideal target audience. Your demographics and psychographics, as indicated by your willingness to spend serious money on PCs for home and office, make you all the more interesting.

LIKE FLIES TO HONEY

Small wonder, then, that consumer product marketers look for ways to cut clutter by putting their logos before you in the midst of your profession and avocation: on the PC's screen. The three quarters of a million of you who paid for this issue are potential targets to break through the clutter.

Marketers have resolutely broken down traditions and taboos in the quest for a higher profile for their products. When we accept brand names and logos in entertainment media that we've already paid for, are we rationalizing or justifying? Are we seeing a slice of life and applauding realism, or are we saturated beyond our ability to protest?

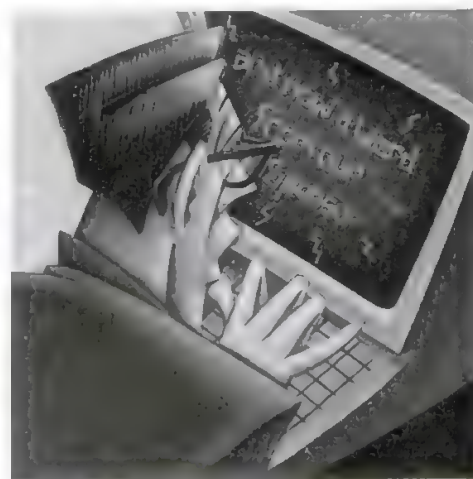


ILLUSTRATION: SHANNON JEFFRIES

Philip Morris has even hammered out a commercial deal with the National Archives. You'll shortly hear announcers intoning things like "Your Bill of Rights, brought to you by Philip Morris." The thought of it turns my stomach. Where does any company, whether its products are beleaguered or not, get off co-opting our national heritage?

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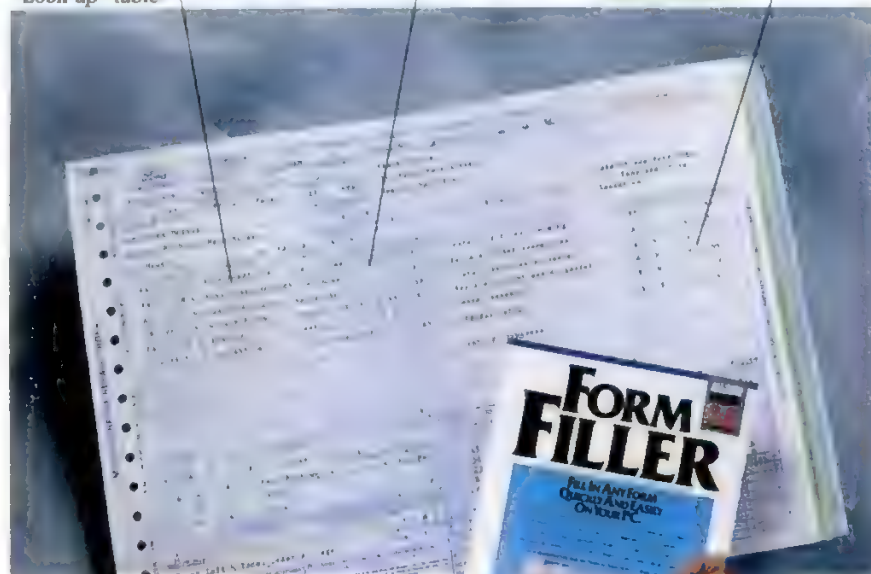
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Bill Machrone

advertisement. It reminds you what product you're using and also informs anyone who may happen to be looking over your shoulder. I fully and confidently predict that we'll see promotional messages buried in sign-on screens in commercial software.

I can see it now. You do a /File Retrieve in Lotus 1-2-3, and instead of a directory of .WK1 files, you get a message like, "Can't find that file? Try Lotus Magellan!" Or you bring up the PrintGraph menu, and while it's loading, a message appears: "Think how much better your presentations would look with Lotus Freelance Plus." There's a big opportunity to do cross-promotional arrangements with complementary software from other publishers, too.

We're already seeing an example of a consumer product and a technical product tied together in our pages. You may have seen the puzzling "Northgate Slims Down" ad. It features a can of Diet Coke next to the machine. Are we to infer that Northgate was somehow overweight? Or are we so enamored of the Coca-Cola logo that it casts a warm and approving glow on the Northgate machine? Whatever the case, it's a new step. While it's obviously selling computers, not soda pop, it's trying to ride the coattails of someone else's multimillion-dollar investment in a share of your mind.

BITING THE HAND

By now, it's probably occurred to you that PC Magazine is heavily supported by the advertising it carries. It certainly has occurred to me. But that's no reason not to have standards. We don't run ads that aren't computer-related. We don't permit advertisers to disguise their ads as editorial material to fool you into reading them.

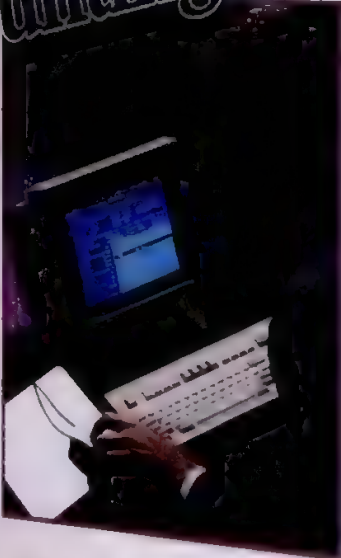
Likewise, you shouldn't tolerate any manufacturer who takes advantage of your captivity, no matter how willing it may be. Whether it's a movie or a record album, a game or a word processor, you've already paid for it. There is a difference between slice-of-life and shameless hype. Advertising is not bad. Marketers are not evil. But in the unending quest for differentiation and an advantage over the competition, they sometimes lose sight of good sense and good taste. Let's help them stay on track. ■

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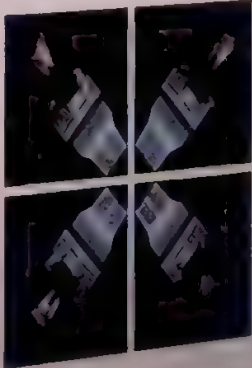


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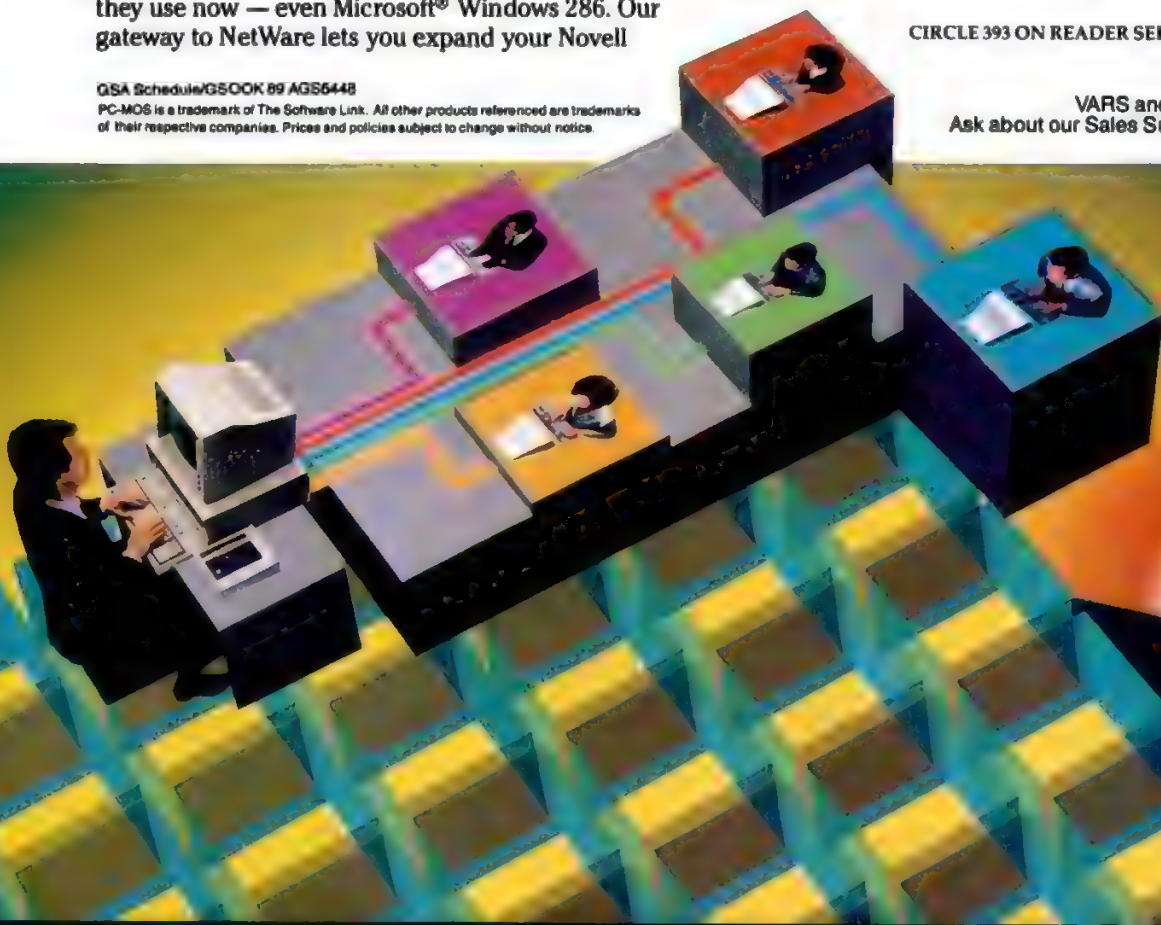
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**To predict the
industry's course,
you need all the
help you can get.
The pages of the
Comdex exhibitors'
guide make good
tea leaves.**

Each year, I like to analyze Comdex by comparing the exhibitors' guide to the one from the previous year. While attendance was up substantially in 1989, the growth rate seems to have slowed. The guide was 606 pages long this year, compared to 596 pages last year, but this doesn't compare to the jump from 1987, when the book was only 528 pages long.

The sizes of the Comdex guides are an interesting measure of the health of the industry. I've collected all of them since the introduction of the IBM PC in 1982. In 1983, a hot year for the industry, when the IBM PC was king, the book hit a record 615 pages. But this banner year was a prelude to the slump of 1984. The book shrank to 430 pages that year, and dropped further to 384 pages in 1985. In 1986, we discovered the joys of clones and newer chips, and the page count grew again—480 pages in 1986, 528 pages in 1987, and the massive jump to 596 pages in 1988.

Anyway, comparing the 1989 guide with the 1988 guide also reveals a few interesting changes in the makeup of exhibitors. Some new categories emerged at this year's show, including handheld computers, backup applications, music products, office automation products (a throwback to 1982, when 33 exhibitors were classed under this category), color printers, portable printers, cash drawers, and the dubious category of "operating environments." This year also saw the disappearance of robotics, probably for a few years.

There was some growth in CAD/CAM products, conversion services, and data-recovery services. Document conversion dropped from 9 exhibitors to 5, while maintenance-related exhibitors doubled in number, from 11 to 22. The new category of forms processing emerged, with 6 firms. Facsimile machines accounted for 42 exhibitors, and 31 fax-card makers were there—both categories up from last year.

If there was a big winner, it was graphics boards, which jumped from an already bloated exhibitor count of 62 in 1988 to 86 in 1989. Motherboard and daughterboard makers were also out in force, zooming from 69 to 94 exhibitors.

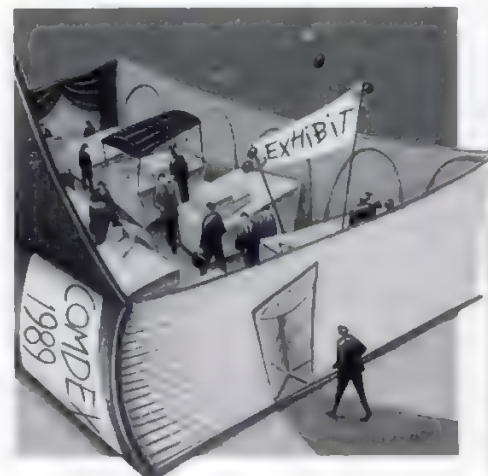
The computer makers are a hard group to pin down. The 1988 show guide listed 80

under the generic "computer" listing. This fell to 74 in 1989, but the so-called "board-level" computer makers jumped from 68 to 74, and laptop computer makers jumped from 40 to 54. The category of personal (non-business) computer makers had 120 exhibitors this year, slightly higher than last year. Overall, it looks like there was little change in the number of people making computers. This may be a bad sign.

ODD ONES OUT

A few anomalies were found. The category of desktop publishing dropped from 24 exhibitors to a scant 15. This isn't a dying category, that's for sure. I figure that the Seybold desktop publishing trade show has spirited away these missing exhibitors. Tape drive makers fell from 38 companies in attendance last year to 28 this year.

The rest of the business looks healthy. LANs are doing well, as is the magnetic media business. Optical storage is up a little, and this



year had more and more media manufacturers showing exotic high-capacity hard drives and floppies.

There isn't anything particularly screwy about this year's changes. Nor is there anything fantastic to report—no breakaways here. It looks like slack tide, and I'm afraid this means the tide will soon turn the other way for a couple of years. Next year, when we count the pages, we'll see where we stand.

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Inside Track

If the industry is **mumbling** under its breath about anything, it's Compaq. Though Wall Street has been **wishy-washy** about the company in recent months, Compaq may just turn out to be the high flyer of the 1990s and may even, perhaps, become the IBM of the 21st century.

Sources close to the company report a number of interesting, somewhat **startling** developments. First of all, Compaq's entry into the minicomputer business with its dual-processor Systempro has turned out to be one of the company's **biggest mistakes**. Not because it decided to compete in this arena. But because it apparently underestimated the response to the system. I'm told the company is **swamped with orders**. The Systempro may not only be Compaq's most successful product ever, but it may undermine DEC and IBM to a degree even Compaq never anticipated.

Some early evaluators say the Compaq \$30,000 system compares favorably in performance to VAX machines costing \$200,000 or more. This seems to prove the old rule that buyers are interested in getting the most MIPS for their dollar, period. **Fears** that Compaq had no experience in the minicomputer field have turned out to be academic. **A bargain is a bargain**, and besides, Compaq does know how to sell into the Fortune 500, having paved the way with its desktops and portables.

Which brings us to the second half of the story. More and more sources are indicating that while Zenith and Toshiba may make **the most noise** about their respective laptop sales, there is quite a bit of evidence that **Compaq is the real market share leader in laptops**. The SLT has sold like hotcakes, and the sleek new LTE notebook machines have met with so much success that the company is **buried in back orders** for them.

Having thrown all these posies at Compaq, let's look at **the bleak side**. First of all, Compaq is at the mercy of Intel. Industry observers in Silicon Valley wonder how Intel can possibly keep its 1-micron-chip fabrication line running at sufficient capacity to cover the demand for the 386, the 386SX, the 385, the 387, and now the five-chip EISA chip set. Worse, the 486 is supposed to be made on the same line.

If Intel hiccups, Compaq (and a ton of other dependent manufacturers) will be in a **heap of trouble**. There are no second sources for any of the aforementioned chips, and if Intel can't provide them, the computer makers will be **out of luck**. This isn't a healthy situation. Intel seems dead set against licensing its chips to anyone. In the past Intel has been **embarrassed** by fabricators who could make better chips from Intel designs than Intel itself could.

Part of the Intel strategy is to **maximize profits** in the face of the onrushing advent of the RISC architecture, which is not only conceptually more efficient but which by its very nature is likely to become an open architecture, in which one chip is just as good as another.

With RISC, the proprietary instruction set is **moot**. The microcode is moved off the chip into the software side of the equation, where it belongs. And once the microcode is removed, the proprietary aspect of the processor is minimized.

This **hurts** Intel and Motorola the most. These two companies profit from their proprietary instruction sets and the **massive incompatibilities** between their processors. Neither company wants to see this gravy train end. In the literature, they refer to RISC designs as "the enemy."

The irony is that because both firms have **refused** to second-source their old-fashioned CISC designs, they are doing nothing but encouraging the entry of RISC into the market. If production cannot meet demand and system manufacturers begin to suffer from shortages, they will look elsewhere for a solution to their stunted growth. And RISC is where they will find the pot of gold.

All that is needed to make the revolution complete is for **Microsoft** and other makers of compilers and programming tools to support the new architecture. As I mentioned previously, it's apparent that Microsoft's development of a so-called **portable OS/2** is targeted at the possibility of a massive architectural change in the desktop computer market. Spell it R-I-S-C.

Personally, I expect to see the same change that we once saw when the world of CP/M computing **hit a brick wall** and we moved to the IBM PC architecture. The same kind of brick wall is looming ahead, and this time the switch will be from CISC to RISC.

Performance increases will be potentially astonishing, but the key to change will have to come from a company that understands leadership. While Sun Microsystems wants this role, it has never been able to communicate to the mass market user of computers. Compaq, on the other hand, is a child of this very market. Compaq has been practicing market leadership for some time already with the 386, advanced designs, EISA, and now a minicomputer.

If the company **feels a chip squeeze** from Intel, it may have to be even more bold, adopting RISC and hoping that the world follows—and the world is looking for a new direction. Hopefully Compaq won't **get greedy** and tie up everything with patents. It has to look at its **roots** and consider where it would be if IBM hadn't promoted an open architecture. ■

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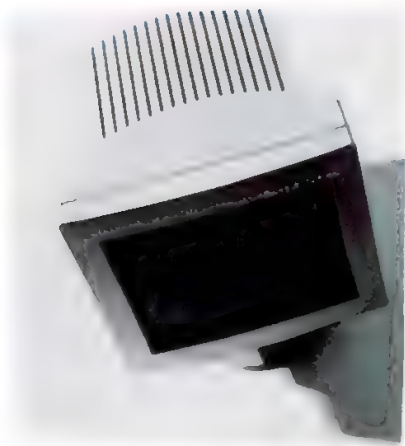
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Jim Seymour



The workstation balloon is in desperate need of deflating. There are sound reasons why Unix workstations haven't taken over the average business user's desktop.

A personal workstation?

For two years, a handful of corporate computing prophets have been predicting the imminent arrival of The Age of the Workstation. Ignoring the general sloppiness of the definition of the word *workstation*, they say they've seen the future of business computing... and that future is built around desktop workstations, not around desktop PCs.

More recently, the success of Unix, the operating system of choice on workstations, has been touted as both evidence of this revolution and also as the fuel behind it.

Yes, Unix has been enjoying something of a boom. And yes, those Unix workstations are very nice: I like the big screens as much as the next computer junkie.

But workstations, at least by any reasonable definition, aren't about to be widely distributed across our offices as general-purpose tools for the business masses.

Three fundamental obstacles stand in their way: Intel's 80486 chip, DOS applications, and yes, Unix itself.

The business press is full of stories these days about the magic of workstations, and especially about RISC workstations. Whether the writer touts Motorola's 88000, Sun's SPARC design, Intel's long-shot i860, or one of the RISC designs from MIPS, Hewlett-Packard, and others, it's terribly obvious in these stories that the presumed processing-speed edge of RISC computers will retire 80x86 designs and the dowdy world of DOS.

Sure, RISC designs have a lot of horsepower. Sure, RISC chips are going to become increasingly important, not only as workstation engines but also as peripheral controllers for DOS and OS/2 devices. And sure, the workstation market is a busy one, if also a financial disaster zone, as the computer makers in that market almost give away their products, chasing market share on that wonderful old principle of making up on volume what you lose on every sale.

But none of these facts implies the replacement of desktop PCs by workstations: the power of Intel's 80386 and 80486 chips is more than a match for the power of RISC processors in typical business uses of computers.

Much has been made of how the love affair between Wall Street's "quants," the number-crunching rocket scientists in the back rooms of the big firms, and their workstations forecasts the future for The Rest of Us. Replacing the old 286 PCs on their desks and maybe a couple of terminals as well sounded great to these traders and analysts. With the right software, that was possible under X Windows on Unix-based workstations.

Even better, the computing power of these workstations meant they could run the huge, proprietary analytical programs that the major trading firms have developed, which screen security and foreign-currency positions for opportunities.

FALSE ANALOGY

But the needs of those high-powered traders hardly match yours or mine—they apply to only a tiny fraction of business PC users. For the rest of us, PCs using Intel's 386 and 486



chips offer ample power. And many of the most numbers-oriented analysts will admit privately that moving from 286 PCs to Sun workstations was as much a status play as anything. Demanding and getting a Sun was a way of showing how important you were to your firm.

Unix itself is the second big impediment to the widespread adoption of workstations. It's big, it's clumsy, and it's demanding, and it also

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Jim Seymour

has an awful user interface.

Recent efforts to put a pretty face on Unix have been promising. The two major interfaces—Open Look from AT&T/Sun and OSF Motif from their competitors—are both good. Still, interfaces aren't everything: you have to have something to run under that interface to make it useful.

STRIKE THREE

In other words, applications.

That's where Unix-based systems fall through the floor. Last year someone said that more than 50,000 DOS applications have been written, and I find that a reasonable number.

But it isn't only the diversity of DOS programs available that makes people prefer DOS to Unix as an applications platform. The strikingly poor quality of Unix business software has a lot to do with it, too.

Have you tried any of the principal Unix business applications? Word processing on Unix? You've got to be kidding! Spreadsheets? PC-style interactive database managers? Presentation graphics programs? Even communications programs?

Unix provides a powerful base for software developers with its advanced tools and capabilities. But few general-business Unix applications take very good advantage of its facilities. There are a few exceptions: the programs provided with Sun's SPARCstations are good, as is the Unix desktop-publishing program, *FrameMaker*. And certainly there are some nifty, highly specialized programs for genetic modelers and statisticians and yep, for securities analysts. But overall, Unix business applications are poor when compared with DOS offerings. And it's the applications that drive the business computing marketplace.

The personal workstation of tomorrow may look a bit like today's workstations. It'll have a big display, and bigger displays are manifestly Good Things. But under the hood, it will be an extension of the 80x86-based DOS boxes we use today.

Unix boxes and software will continue to trickle into the business market, and such good ideas as NeXT's high-quality development tools will attract some mainstream software. But don't look for a workstation in every garage anytime soon. It's going to be an Intel/DOS world for a long time to come.

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William F. Zachmann



OS/2 and Unix are like a pair of pliers and a socket wrench. Each has its appropriate domain. And a complete toolbox must have both.

“Who needs OS/2 anyway?”

When posed by the more ardent Unix supporters, this question is really more of a challenge than an inquiry. Those folks don't really see why anyone should bother with OS/2 at all.

Of course, it's easy enough for OS/2 partisans to simply ignore them. Despite Unix's strength in the specialized scientific and engineering workstation market, it hasn't had much impact in the office environment. And OS/2 is clearly the intended heir to DOS as far as IBM and Microsoft are concerned. It offers a logical migration path for the enormous installed base of DOS software and is supported by dozens of vendors.

So you might well ask instead, “Who needs Unix anyway?” Why bother with an entirely different and unfamiliar operating system? But it's misleading to view the issue this way. To treat OS/2 and Unix as mutually exclusive alternatives in a zero-sum game is to miss the point. A better approach is to examine the relative advantages and disadvantages of OS/2 and Unix in their possible contexts of use. This means it's important to take account of the specific background of the organization as well as of the relative technical merits of the rival operating systems.

Especially with sophisticated mission-critical enterprise systems, the training, knowledge, and expertise on hand makes a huge difference in deciding which operating system is best. An organization already using Unix workstations for scientific or engineering work can readily make use of Unix in business applications. But one with little or no background in Unix, but with a large number of personal computers running DOS, is likely to see OS/2 as the more logical migration path. Since companies of the latter type are far more numerous than those of the former, I expect OS/2 will predominate in business.

Still, just because this is likely to happen doesn't mean it ought to happen. So let's examine the relative advantages of OS/2 and Unix in their different contexts.

In multiuser systems, Unix unquestionably has the greatest advantage. Unix originated as a multiterminal character-mode operating system, whereas (at the time of this writing) no

one has said anything about creating a multiuser version of OS/2. Unix offers the possibility of using a largely standardized operating system across multiple hardware platforms. Even more important, it offers a standard operating system for the new line of aggressively priced multiuser systems based on one or more standard microprocessors, and it's therefore the key to delivering minicomputer systems at microcomputer prices.

SUCCESS ASSURED

Unix cannot be ignored by any organization concerned about controlling the costs of information systems. It's no accident that key minicomputer vendors like Digital, Hewlett-Packard, Bull, and Data General have gotten aboard the Unix bandwagon in recent years. Even if Unix were a complete flop on the desktop, it is all but certain to be an enormous success as the standard nonproprietary multiuser operating system of the 1990s.

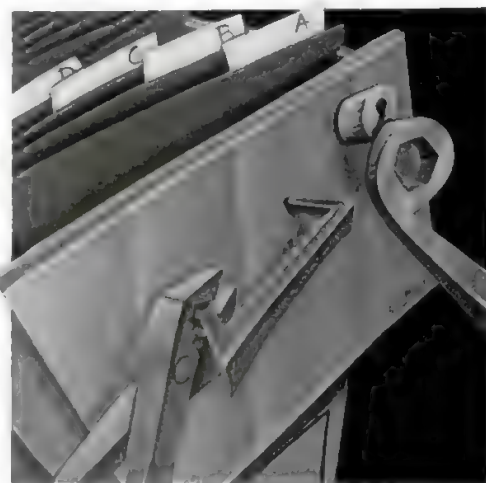


ILLUSTRATION: SHANNON JEFFRIES

The traditional multiuser terminal configuration will be with us for a long time, as it is the most familiar option for most data processing departments. But as information systems professionals begin to gain experience with the newer client/server architectures, network servers will become the most rapidly growing part of the computer market.

This segment is currently shared by DOS servers, Novell's network operating system,

William F. Zachmann

and various Unix or Unix-based systems. Next to these long-established competitors, OS/2 is the new kid on the block. But with the advent of *SQL Server*, *LAN Manager*, and a growing range of third-party software offerings designed for networks, OS/2-based LAN server options are cer-

tain to proliferate in the months ahead.

Unix currently has a slight advantage in this area, too, because it's more fully developed than OS/2 in such areas as the use of the Intel 386/486 instruction set, support for symmetrical multiprocessing, and advanced security features. For example, at the time of the announcement of the Compaq Systempro, the only operating systems to provide symmetrical multiprocessing support for it were Santa Cruz

Operation's SCO Xenix V Operating System and SCO Xenix 386.

The magnitude of this head start will depend on how quickly Microsoft can incorporate these advanced features into OS/2. Without them, OS/2 servers will remain limited in their expansion capability and will be completely unsuitable for many mission-critical applications. But with them, OS/2 would be on an equal footing with Unix.

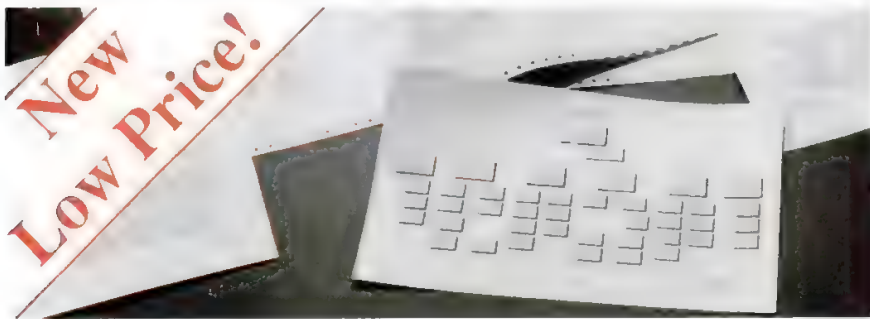
OS/2 does stand to gain an advantage in LAN servers by virtue of its compatibility with desktop systems that are running OS/2, however. While Unix servers can provide DOS software support, they will never be able to offer full interchangeability with OS/2 software. On the other hand, if OS/2 were to flop on the desktop, then it's not likely to go anywhere on servers, either.

However, it is on the desktop that OS/2 has the greatest advantage. Unlike Unix, OS/2 was designed from the ground up to be a single-user multitasking operating system for desktop workstations. Further, OS/2 is the more natural migration path from DOS, and OS/2, not Unix, is where the successful DOS software developers are putting their resources.

There's little advantage in using Unix except where it is already familiar—at a very small minority of businesses. Unix is as demanding as, if not more demanding than, OS/2 in terms of system resources, and the former offers no better performance. Moreover, it has an extremely unfriendly command structure lurking below the surface, which, unlike OS/2's underlying command structure, is not even remotely familiar to DOS users. And Unix's most plausible graphical user interface, OSF Motif, is basically another version of the OS/2 Presentation Manager.

In summary, though Unix will probably retain most of the high-end workstation market and will dominate the multi-user market, OS/2 is likely to be far more successful on the desktop. Network servers will be shared by both alternatives, but the proportion of Unix to OS/2 will depend on just how quickly OS/2 gains important server capabilities that Unix already has. OS/2 may even start chipping away at the high-end workstation market—until now Unix's own turf.

The zealots on both sides will not be happy with what I have said here. But the sensible majority of users will find that each operating system has its place. ■



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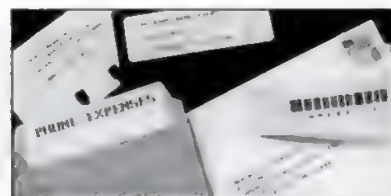
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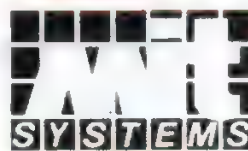
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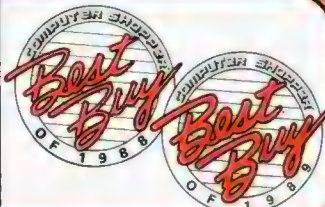
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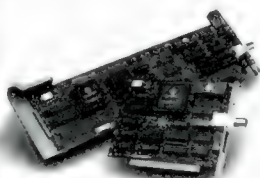
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CIRCLE 191 ON READER SERVICE CARD

Stephen Manes



The annual Fall Comdex trade show is a heady mixture of hype, glitz, sleeplessness, and disillusionment—and even an interesting product or two.

“Good luck!”

No, this isn't a Valentine's Day greeting; it's what every Vegas change-maker says while handing you a cupful of quarters. I need it, all right, and not just at the one-armed bandits that beckon the instant you step off the plane. I am in the November home of the zoo called Comdex, where a hundred-odd thousand lost souls of the computer biz trudge into the smog-laden air and smoke-infested boîtes, seeking trends, deals, jobs, The Next Big Thing.

What they find, first off, is *The Thing Gone Wrong*. Experience steels you for it: the delayed flight, the cancelled meeting-of-a-lifetime, the hotel room that isn't there—or the one that *is* there, complete with a beehive, ant farm, or Roach Motel of jolly companions.

In my case, Hertz's “reservation” system was programmed to favor Anyone Who Shows. As one after another stiffed customer steps up to the counter, a grim-looking employee emits a heartfelt “No, sir, we don't have any cars at all.” At which point the traveler ejaculates, “But I had reservations *three months* ago!” and yanks his luggage angrily in the direction of a phantom taxi.

What, you may ask, has all this to do with computers? Well, last I heard, Hertz had a computerized reservation system—yet another example of why silicon systems are only as good as the people who run them.

But then, disappointment is the Comdex keynote nowadays. Ask the classic trade-show question—“Seen anything wonderful?”—and you used to get a laundry list. Now you get a puzzled look, followed by head-scratching and the phrase “Not really.”

Part of the problem is gun-jumping. These days the hottest products are preannounced and previewed and prehyped, so the actual unveilings are bound to disappoint. The new barn-burner that sounded so good in the press releases turns out to look as ugly as slime, or else it lacks a handle or an Alt key or a battery that lasts longer than a sneezing fit.

Take laptop and notebook computers: plenty were on display, but even the very best of the ones I saw were Close to What I Want but Not Quite. Of course, as desktop units increasingly turn into front ends for The Lousy Networked Software Someone Upstairs Hands You, note-

book computers are becoming the true personal computers of the nineties, and their very intimacy may be why people hurl so much vitriol at their failings.

NOTHING BUT HYPE

Then there's the much-trumpeted Major Announcement. Typically it turns out to be a proclamation that sometime before the next Comdex, Company 1 and Company 2 will join forces to do something absolutely wonderful. Of course, you know that when and if the something wonderful actually happens, it won't be as wonderful as all that. Microsoft, for example, expended considerable effort hinting that we should see *Word for Presentation Manager* sometime this year. The fact that the rest of the world had surmised this and yawned did not seem to dampen the company's enthusiasm.

Comdex is overheated parties and sneaky back-room deals and cancerously smoke-filled rooms. It's the very worst hustlers, the lames



ILLUSTRATION: SHANNON JEFFRIES

you wouldn't hire in a millennium, turning up in fancier suits than last year and in higher-level jobs with companies that don't know better. It's guys who don't know diddly bragging about their \$5,000-a-day consulting gigs, and gals who know plenty lamenting about their booth positions down some dead-end hallway next to someone selling—I kid you not—“floppy disk condoms.”

And the show is so big you can't begin to

Stephen Manes

guess which products you really want to see. You know the ones you *don't* want to see: the eleventh-seventh clone running benchmark tests proving conclusively that a fast 486 can be tweaked to outperform a slow 8088; the eleventh-eighth VGA monitor. The serendipitous makes it all worthwhile, but there's less and less serendipity every year.

There still is some. I first stumbled on Intel's flash memory technology in the interesting-but-someone-else-will-do-it-right new notebook machines from Psion. Flash memory is basically an EPROM that can be erased with electrons instead of light. Psion is using it for no-battery-needed "silicon disks"—a slick idea likely to catch on. But a slicker use is in a hot-performing printer controller board to which Intel is giving away the schematics as a way of selling more of its i960 processors. Flash memory on the printer board holds fonts; one download and the font stays there until you order otherwise—very nice indeed.

Another item I never expected to get excited about was an 8514/A video card. But ATI Technologies' Ultra card has a couple of gimmicks. First, it contains both Micro Channel and ISA circuitry; the board flips over to fit into either bus. Better yet, it uses proprietary outline fonts to generate screen fonts that truly mimic printer output. Garamond looks like Garamond; you'd never confuse it with Times, and you can read it even in shyster-contract 6-point type.

The ATI board's coprocessor applies a technique called anti-aliasing to subtly gray out character edges and smooth "jaggies." ATI claims the board will work with Bitstream, Adobe, and other popular fonts under *Windows*, *Presentation Manager*, and *GEM*. If it looks as good in real life as it did in the demo, every desktop publisher will crave one—particularly at \$795 list.

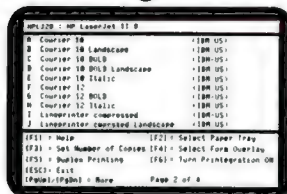
Two other items of note: HeadStart Technologies' machines with integral CD-ROM players. These 8088 and 80286 boxes seem otherwise nothing special, but each comes with a mouse and gigabytes of software and data, including the Grolier encyclopedia, *Microsoft Bookshelf*,

The National Directory, *PC Globe*, and games galore. Oddly, although Philips owns the company, the CD-ROM drive is a Sony. Odder still, these units steal a march on the Philips CD-I system and the much-rumored Microsoft/IBM multimedia machine. The marketing should be interesting: Will this be *The Computer That Comes with a Free Encyclopedia*, or will King Kong Bundy go one-on-one with *The Chicago Manual of Style*?

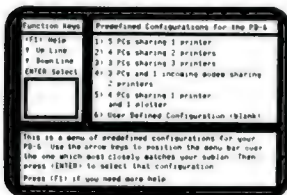
But it's no wonder that, despite expense accounts that cover everything but gambling losses, only the most intrepid Comdexers stick around for the Friday finale. My mid-Thursday flight carried at least one other burnt-out journalist and two Seattle CEOs, including none other than Microsoft's Bill Gates. For those interested in market analysis, I can report that, yes, he does fly coach and carry his own bags, thereby saving his company (and William Gates, its chief stockholder) zillions of dollars a year in "But the boss does it" first-class tickets. Gates seemed a little burnt-out himself; after perusing a book, he draped the airplane blanket over his head, looking very much like a corpse.

I knew the feeling exactly. ■

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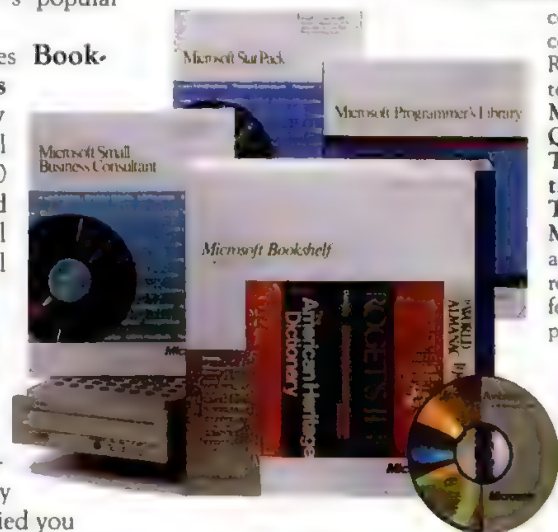
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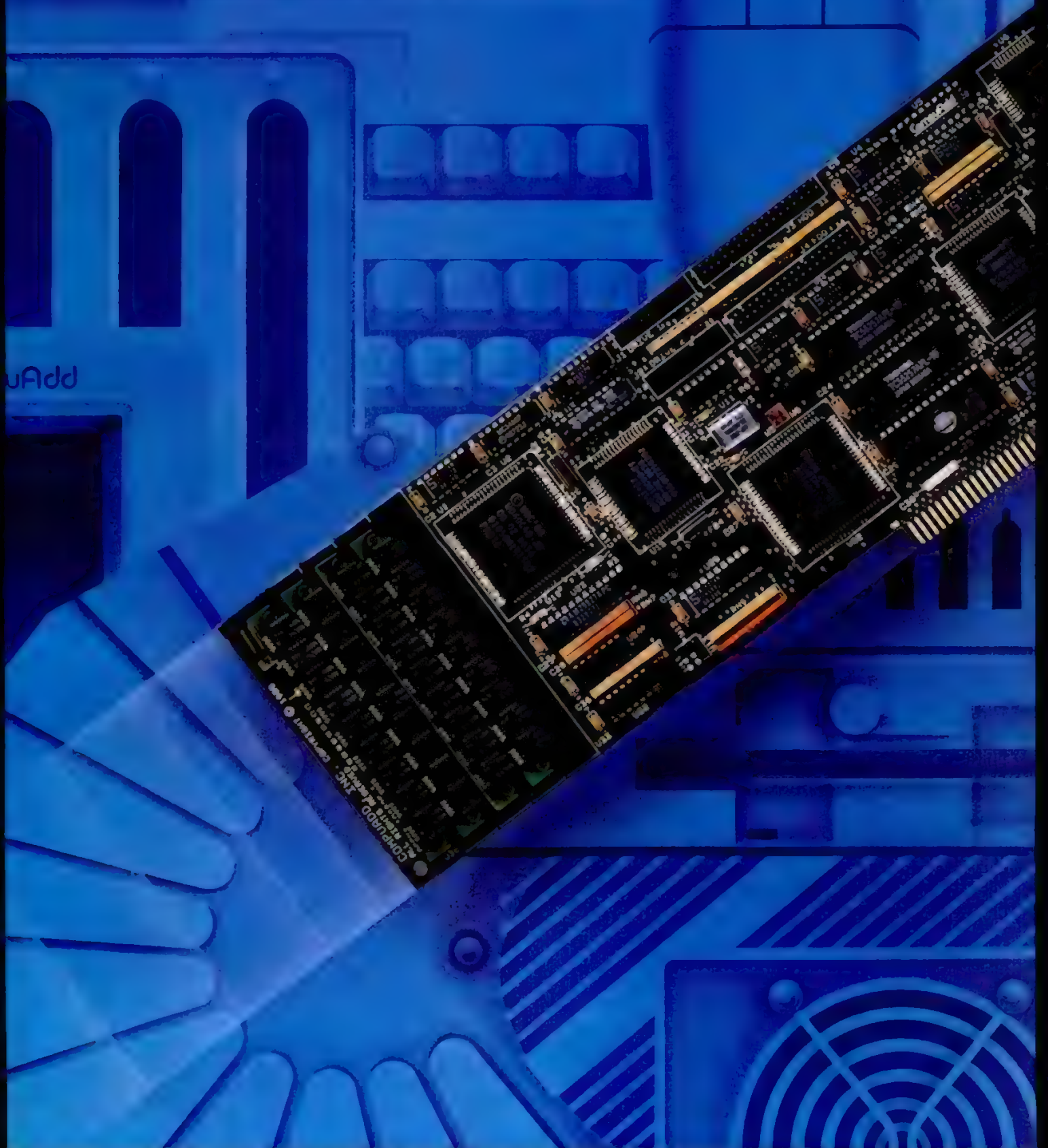
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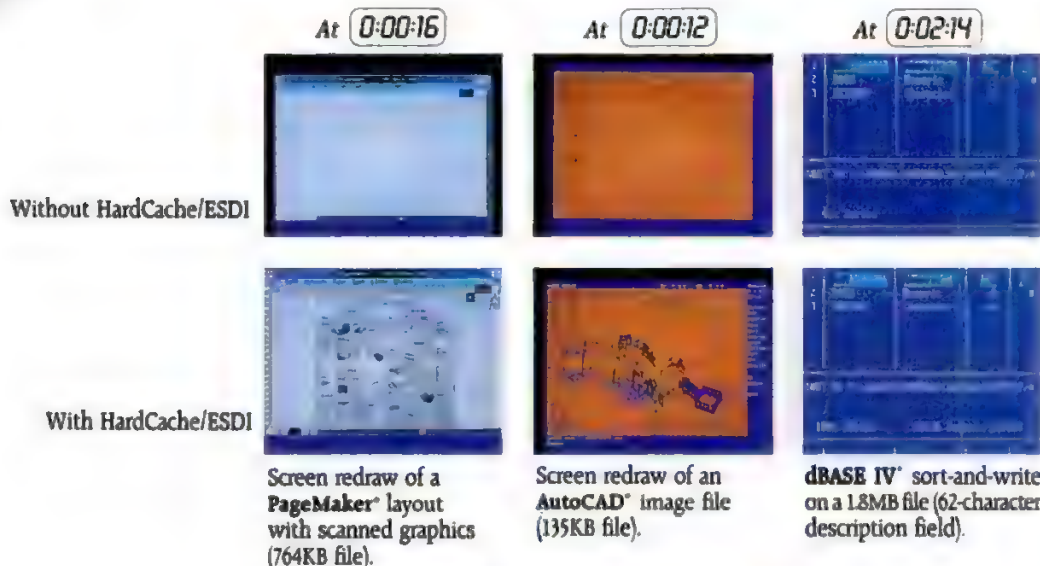
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Self-sufficient PUBLISHING

by Luisa Simone

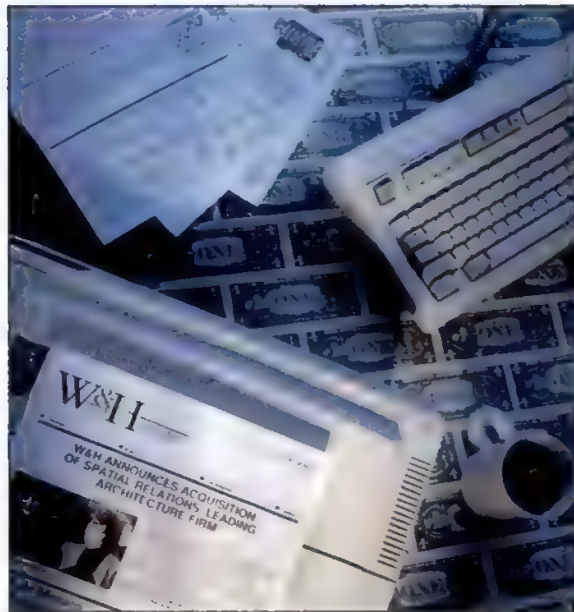
Low-end desktop publishing is not just for dot matrix printers anymore. Inexpensive DTP programs are addressing the needs of the business community users who want to harness the power of their laser printers to bring high-quality fonts and high-resolution art to their documents.

How times change. Only a year ago low-end desktop publishing (DTP) programs were easy to define—limited toolsets, low-resolution output, and moderate prices distinguished these products from the major-league players *PageMaker* and *Ventura Publisher*. But, in a perfect example of the synergy between hardware and software, the recent influx of high-resolution printers into the business community has radically altered the low-end DTP market.

The laser printers found in most offices still produce more words than pictures, making access to high-quality typefaces the overriding concern of business users. The hardware available today reflects that concern: some of the new 24-pin dot matrix

printers include up to 14 typefaces in ROM, and a veritable library of hardware cartridges is available for the Hewlett-Packard family of laser printers. Low-end DTP programs now supply a greater number of printer drivers than ever before, allowing users to easily access resident fonts.

However, the most flexible source of high-quality type remains in the soft or downloadable font arena. Even the makers of *PFS:First Publisher*, the low-end DTP market leader and traditionally the front end for 9-pin dot matrix printers, moved one step closer to high-resolution output last year by adding support for Bitstream fonts. At 300 dots per inch, the near-typeset quality of Bitstream fonts can be appreciated only when



PHOTOGRAPHY: JAMES PORTO

output to a laser printer like the HP LaserJet.

Bitstream's *Fontware* deserves some additional discussion because it is the technology most likely to be found bundled with many low-cost DTP programs, either in the form of samplers or as a complete installation kit. Unfortunately, retrofitting Bitstream's installation to some of the older programs elicits confusing procedures that can prove problematic for the novice DTP user. Bitstream typefaces are raster fonts. During installation you must create a bitmapped version of the typeface for each specific point size you want—wasting valuable disk space and making it impossible to resize a font from within your application program.

Version 3.0 of Bitstream's *Fontware* promises to eliminate some of the current difficulties associated with bitmapped fonts, notably with faster compilation of the raster images and the ability to share bitmaps among different applications. Though Bitstream will never match the convenience of the totally scalable vector fonts supplied by Adobe Systems and Agfa Compugraphic, it can certainly match the quality of the typefaces from these competitors.

DEVELOPERS' DILEMMA

In order to take advantage of 300-dpi fonts, whether from Bitstream or Agfa Compugraphic, low-cost DTP programs have been forced to fine-tune their type-handling features. But adding hyphenation algorithms, text wrap, and kerning has created a dilemma for developers: how to amplify the program's power without distorting the learning curve.

Traditionally, low-end programs merely provide a subset of the functions found in *PageMaker* or *Ventura*, the theory being that fewer tools make for less confusion. Though the programs reviewed here can't possibly provide all the functions of *PageMaker* or *Ventura*, a few of them handled the complex layout of our test newsletter with surprising aplomb.

More to the point, these programs attempt to make the sophisticated tools they supply easier to use. WYSIWYG editing and mouse-driven menus are the standard methods employed to guide beginning users through the complexities of DTP. *Finesse* even takes one of the givens of the

GEM Desktop Publisher interface—the options box—and uses it to prompt you with the next logical action. *Express Publisher* seeks to teach by example; instead of requiring that you understand the difference between rag right and full justification, you simply click on the appropriate picture icon.

INTEGRATION ON A SMALL SCALE

The trick when paring down the toolset, of course, is to leave the right tools in. The practical question is: what do average users—mid-level managers and secretaries—need in order to create professional-looking documents?

Though the programs
reviewed here can't
possibly provide all the
functions of a high-end
package like *PageMaker* or
Ventura, a few of them
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with surprising aplomb.

Anyone publishing a document must be able to combine text created in a word processor with tabular material from a spreadsheet. It is essential that the desktop publishing program import graphics images pulled from a clip-art library or created in an ancillary charting or drawing program.

Integration of this kind actually works as a better definition of desktop publishing in general because it applies to every level of program sophistication. Low-end programs should be concentrating on just this sort of small-scale integration; high-end programs like *PageMaker*, having successfully incorporated these capabilities, now deal with integration on a large scale by merging full-color images and accommodating multiple contributors to a document via a network.

The *PC Magazine* test newsletter contains unusual indents, numerical tables, and a variety of art elements, ranging from

scanned images to pie charts. The newsletter proves that true integration is still only a goal—not an achievement—of low-cost desktop publishing programs. Only one of the products in our roundup, *PageBuilder*, claims to read .DIF files. And though many of the programs can import files from popular word processors, they can't retain the tab information.

The real problems—particularly with our image-laden newsletter—revolve around issues of graphics compatibility. Not all of the fault lies with the low-cost DTP programs. Consider for a moment that as bitmapped graphics, both .PCX and TIFF files vary in resolution (dots per inch) and color (number of bits deep). The TIFF 5.0 spec, for example, can include information for up to 256 colors. Also, most graphics programs are still straddling the transition from TIFF 4.0 to 5.0.

The *PC Magazine* testing script contained various versions of the same image—ranging from 300-dpi TIFF to 72-dpi .PCX. Programs with limited import capabilities such as *Springboard Publisher* forced us to turn to commercially available third-party conversion programs such as *Hijaak* from Inset Systems and Terravision's *The Graphics Link Plus*.

Conversion software was essential for those programs that run under Digital Research's *GEM* (Graphical Environment Manager) interface, such as *GEM Desktop Publisher* or *Publish It!* *GEM* accepts only native graphics formats with either an .IMG or .GEM extension. Of course, this inconvenience disappears if you work exclusively in the *GEM* environment. (*GEM* is admittedly not as powerful as the multitasking *Microsoft Windows* environment, but a third of the programs in this review gladly forsake the promise of multitasking for the benefits provided by *GEM*'s efficient code, smaller memory requirements, and speedy response times.)

Digital Research is trying to ease the nuisance factor by marketing several modest conversion utilities: each \$15 program translates one file format (.PIC, .PCX, TIFF, .DXF, .CGM) to the appropriate *GEM* format. And a new version of *GEM*, due out early this year, will address graphics compatibility by incorporating *Hijaak* into the *GEM* environment.

THE BOTTOM LINE

If you must combine graphics from many different sources, buy *PageMaker*. It imports the greatest number of different formats and uses intelligent filters to interpret

For the features section of this issue, the associate editor was Edward L. Perratore. The project leader was Wendy Pérez.

the various flavors of .PCX and TIFF files. The aggravation you save will more than compensate you for the \$500 average price differential.

It's easy to imagine how small businesses or individual users might dwell on the price issue, but truthfully, cost is an issue for companies of all sizes. Large corporations, where desktop publishing needs range from professional artists producing the annual report for stockholders to individuals tweaking internal quarterly-earnings statements, may actually be in more of a bind. Even though the company may want a program that integrates the design efforts of the entire firm, at \$895 and \$795 respectively, even large corporations think twice before putting a copy of *Ventura* or *PageMaker* on the desk of every sales

manager or secretary.

A wild concept (but a cost-effective solution) would be the development of a PC-based low-end DTP program that is compatible with templates produced in a high-end DTP program. The paradigm already exists on the Macintosh platform. Quark's *QuarkXPress* has quite properly been lauded for its professional-level typesetting capabilities, as well as its ability to handle full-color continuous-tone photographs. The program matches, and in some cases exceeds, the functions of *Ventura* and *PageMaker*. At \$795 this is a tool for professional designers, but at \$295, the company's *QuarkStyle* is intended to meet the needs of corporate DTP users. Al-

though it doesn't match its big brother feature for feature, it can import and interpret any page layout created by *QuarkXPress*.

A corporate art department can design a template, install fonts, and create paragraph styles with *QuarkXPress*. *QuarkStyle*, economically residing on each individual desk, can be the low-level tool used to integrate text files and graphics into a standard corporate template. Unfortunately, because both *PageMaker* and *Ventura* use proprietary file formats, this scenario just isn't feasible on the PC until Aldus or Xerox enter the low-end of the market.

SELECTION CRITERIA AND THE REVIEW PROCESS

The products we review here had to meet our rigorous selection criteria. In addition to price—*PFS:First Publisher*, *Publish It!*, *PageBuilder*, *GEM Desktop Publisher*, *Finesse*, *Springboard Publisher* and *Express Publisher* all sell for less than \$300—the programs had to include support for laser printers and high-quality fonts. WYSIWYG editing, mouse support, and the ability to import text and graphics files were also required features.

Although programs like *PFS:First Publisher* made their names by running on 8086 systems, the PC Labs test bed tried to duplicate the average hardware installation of corporate DTP users today: an 80286 IBM AT running at 8 MHz with 1MB of expanded memory; an EGA monitor; a Microsoft bus mouse; a 40MB hard disk drive; and an HP LaserJet Plus with 2MB of additional memory and a Microsoft Z cartridge.

The PC Labs testing script, however, was anything but average. The Suitability to Task ratings and benchmark test results report on tasks like importing a 24-page text file, compatibility with graphics and word processing programs, and response times for file-handling capabilities such as saves.

Our sample newsletter, created by an imaginary architectural firm called Westfield and Hampstead, is an absolute bear to duplicate. Narrow columns, downloadable fonts, irregular text wraps, various graphics formats, justified copy, and stories jumping to noncontiguous pages push these programs to their limits and beyond. While your publishing projects may never equal the complexity of our sample document, our testing reveals which products can deliver professional-looking printouts—without the headaches that go hand-in-hand with professional-level tools.

SUITABILITY TO TASK

"Suitability to Task" ratings for desktop publishing programs first appeared in *PC Magazine* when we reviewed high-end packages (December 27, 1988). While the programs reviewed here don't claim to compete directly with *PageMaker* or *Ventura Publisher*, they have increasingly been incorporating high-performance functions like hyphenation and text wrap.

This significant shift in the market, and the corresponding shift in the tool sets of these programs, inspired us to keep two of the categories used to rate high-end programs. Wherever the task names remain the same as those we used previously ("four-page newsletter" and "three-fold brochure, heavy graphics"), so do the tasks. In other words, you can compare the scores in these categories with the ratings received by *PageMaker* and *Ventura*. We think you'll be impressed by how well some of these low-end programs fared.

In good conscience, however, we could not judge these programs on their ability to handle long documents or color output. So, what was originally a long 100-page document we reduced to a more appropriate length of 25 pages. And in-

SUITABILITY TO TASK				
PROGRAM NAME				
	1	2	3	4
Four-page newsletter				
Three-fold brochure, heavy graphics				
Medium-length document				
Internal report or memo				

stead of rating these programs on a full-color magazine or corporate report, we judged them on their ability to produce an internal report or memo (with a spreadsheet or graphic).

The possible ratings are: 0 = completely unsuited for the task, 1 = poorly suited for the task, 2 = fair for the task, 3 = good for the task, and 4 = excellent for the task.

Express Publisher

by Luisa Simone

Express Publisher, a \$149.95 DTP program from Power Up Software Corp., offers some very powerful features. For ex-

ample, it supports Agfa Compugraphic fonts and provides options not yet found in *PageMaker*, such as search-and-replace and the ability to apply a paragraph style to a currently selected frame or an entire story or document.

The program's greatest flaw is that it overlooks essential conveniences. For example, the company claims that the 17 icons along the top of the screen make the program easy to use.

Available icons include one to link text frames, a second to align objects, a third to make frames equal in size, and another to

OUR TEST DOCUMENT: A Challenging Newsletter

by Luisa Simone

The *PC Magazine* staff truly enjoyed creating an imaginary architectural firm—Westfield and Hampstead. With corporate headquarters in Chicago and regional offices all over the world, it stands to reason that W&H would have need of a company newsletter.

In our zeal to make the newsletter as real as possible, we also made it pretty difficult. For example, the HPGL import of a CAD drawing on page 1 was problematic even for *PageMaker*. In the current version of *Windows*, vector files (although totally invisible to the user) must use the *Windows* Clipboard

Metafile Format to compose the image in memory prior to importing it into a document. Although the memory error message we received wasn't explicit, we kept running into the 64K RAM limit on Metafiles. Reducing the size of the file solved the problem for *PageMaker*. This problem was a moot point for this particular story, however, because low-cost programs don't claim to import HPGL vector images. But the ability to handle different file formats—vector as well as bitmapped—is becoming increasingly important to all levels of the DTP market.

The photographs on pages 1 and 2 of

our newsletter were scanned with a Microtek MSF 400G scanner and *Eye-Star Plus* software. The resulting files were saved in several different formats including 300-dot-per-inch black-and-white TIFF, 72-dpi TIFF with 256 shades of gray, and both low- and high-resolution .PCX. Where necessary, these images were translated to GEM's .IMG format using third-party conversion programs such as *Hijaak* from Inset Systems and *The Graphics Link* from TerraVision.

The floor plan on page 1 was generated in *Drawbase* from CAD works and exported as both .DXF and HPGL vector files. The logos that are sprinkled throughout the document, in the form



W&H ANNOUNCES ACQUISITION OF SPATIAL RELATIONS, LEADING ARCHITECTURE FIRM

BY RICHARD STANLEY



Margaret Sollich and Catherine Clark, the duo behind Spatial Relations business.

Westfield and Hampstead has taken an important step toward becoming one of the nation's largest full-service architecture firms with its acquisition of Spatial Relations, Chicago's leading interior architecture design group.

W & H Director Carleton Aston told reporters, "By bringing Spatial Relations into the W & H fold, we're going to have a firm that's ready to answer all the client's questions and satisfy all his needs, from the first ton of concrete to the last carpet tack."

Ten-year-old Spatial Relations, which, like Westfield & Hampstead, was founded in Chicago, grossed \$32 million in design commissions last year and has projected billings of \$37 million this year.

continued on page 3

Forum de Monaco Wins Prestigious Europe Cup

BY PAUL MURPHY

Westfield & Hampstead executives clustered around their fax machines last month as they waited for official word from Paris that the Forum de Monaco, a W & H-designed mixed-use conversion center in Monaco, had won the coveted Europe Cup for architectural distinction. The rumors turned out to be true.

This marks the second time that W & H has won the Europe Cup, which has been awarded every year since 1932 (1940-44 excluded) to the building of the greatest architectural distinction completed in Europe during the year. Fifteen years ago, the firm garnered the same prize for the 100 Lundersplatz office complex in Berlin.

The Forum de Monaco, a 600,000-square-foot glass-walled edifice, sits on a 30-acre site overlooking the Mediterranean. The award cited the skill of the two head architects, Joseph Musker and Grace Yavana, in solving difficult foundation design problems caused by the building's location on reclaimed land.

The award also made note of "the architects' careful consideration of the architectural history of the area and the special seaside location on which the building was constructed."

Musker and Yavana will travel to Paris to receive the award in person, and then the two will enjoy a week's vacation in Ibiza, courtesy of the Federacion del Arte, the Spanish arts organization in charge of next year's Europe Cup proceedings. ■



The Forum de Monaco before concrete was poured on the Europe Cup map.

1



Not Just Doing Well...DOING GOOD

BY CATHERINE CORBETT

Tenth Westfield Scholarship Goes to Chicago Native...The Scholarship Subcommittee of the Westfield & Hampstead Directorial Board has awarded the tenth annual Westfield Scholarship to a hometown favorite.

Charles Young, a 25-year-old Chicago native who attended Northwest University and is currently completing graduate studies in architecture at the University of Chicago, will receive the \$20,000 prize. The award is made annually to the most promising young architect studying in any United States graduate school of architecture.

Young competed against 65 other architecture students representing 41 schools of architecture, all of whom had completed detailed plans for a fictitious museum addition project.

"I'm thrilled," Young said when told of his prize, "both for the obvious reason that it's a great honor and for the pragmatic reason that now I can start my career in the black!"

Young jokingly described his architectural style as "representative of the traditionalist assault on Post-modernism. In my designs, I tend to avoid heavy decorative treatment on commercial buildings," he said. "I want my buildings to speak softly and let the people inside carry the big sticks."

Red Cross Blood Drive a Success...The most successful blood drive in W & H history ended last week when the 524th volunteer proffered

his arm to a Red Cross lab technician. W & H has run a blood donor program for over a decade, but this year employees at corporate headquarters in Chicago responded to the city's critically depleted blood supply with unequalled generosity—surpassing the target goal of 400 donors by more than 30 percent.

Anthony Giacometti, a representative from the local chapter of the Red Cross, praised the donors for their altruism, and Carol Nixon—the health benefits coordinator here at W & H for her organizational skills. "The simple truth is that Miss Nixon, and all of the other volunteers, will save people's lives. We're very grateful for their help."

W & H to Sponsor Major Mies van der Rohe retrospective...Westfield & Hampstead has announced its sponsorship of a major Mies van der Rohe retrospective exhibition that will travel to art museums in three countries over the next two years. The collection, which includes 90 original sketches and drawings, 50 photographs, and 21 scale models, will be displayed at the Metropolitan Museum of Art in New York, the Art Institute of Chicago, and the Museum of Contemporary Art in Los Angeles. Following the American tour, the exhibition, which was designed and assembled by a consortium of architects and curators from around the country, will travel to London's Tate Gallery and the Centre de Pompidou in Paris.

Each museum on the itinerary will fund its own mounting of the exhibition, but W & H will cover all the shipping and overhead costs. In each city, a series of gala previews will be organized; clients of W & H will receive complimentary tickets as well as hardcover copies of the show's lavishly illustrated catalog. The accompanying schedule of exhibition dates (located on page 4)

continued on page 4

Common Sense, Financial Sense: Making Sick Buildings Well

BY CLAIRE GIBSON

Newspapers are full of reports about companies suffering productivity declines and increasing absenteeism attributed to poor lighting and ventilation in offices. It's no secret that some skyscraper ventilation systems more than 25 years old need to be not only replaced but rethought and redesigned as well (Figure 1).

A good example can be found at the landmark 31-story Witherspoon building, located not far from W & H's

headquarters in Chicago. When its new owners took over the building in 1985, it was only a matter of weeks before tenant complaints began pouring in.

Asbestos insulation had been removed from the building as early as 1975, but tenants expressed concern that the ventilation system was dirty, inefficient, and dangerous.

A design team from W & H was able to diagnose

the air-flow problems and plan an entirely new system that minimized new construction in a matter of weeks. The new system, which became operational in December 1986, was installed in less than a year.

While they were at it, the architects also suggested that new thermal windows be installed on every floor of the building, replacing windows dating from 1946. Though the new win-

dows look no different to tenants (or architecture critics), they save approximately \$40,000-\$50,000 a year in heating costs by keeping the cold air out.

In summer, the windows also keep the cold air in, and the new air-conditioning system, which circulates air through the W & H-designed ducts, is also a big energy saver.

Tenants at the Witherspoon building report an av-

2

wrap text around graphics.

But by moving text wrap from a menu to the toolbox, *Express Publisher*, in effect, demotes it. In most DTP programs the text wrap feature remains active once invoked, automatically rewrapping text each time you change the layout. With this implementation, each time you change the

size of the graphic, alter type specs, or reposition elements on the page, you lose the wrap. I was forced to invoke the text wrap tool at least 20 times while designing page 2 of the PC Labs test document.

Frequent revisions are also discouraged

format of *Microsoft Excel*.

Finally, we created a bear of a design. In addition to the Adobe downloadable font (Futura Extra Bold on pages 1, 2, and 3), we used wildly different column widths, wrapped text around graphics (page 2), had graphics surprinting rules (page 3), mixed serif and sans serif type faces in body copy (page 2), incorporated a drop cap into text (page 3), and jumped several stories to noncontiguous pages.

To mimic this newsletter with low-cost desktop publishing programs, we made some compromises. For example, Bitstream bitmapped fonts rather than Adobe's outline fonts were used wherever possible. And, while no low-

by *Express Publisher's* limitation to one working view of the page: actual size. A full-page view shows the position of graphics and greeked text, but you can't manipulate the frames in any way. Moving elements in the actual-size view requires that you suffer constant, often unnecessary screen redraws.

cost program can be taken to task because it doesn't import an HPGL vector file, we did test programs for standard file format compatibility. In the low-cost arena that usually means .PCX and TIFF files.

The idea was to produce a document that used high-quality text and high-resolution graphics. These programs did encounter real obstacles, but the hurdles were related to graphics import and table creation. We discovered, to our surprise, that low-cost desktop publishing programs are even capable of complex layouts. For a look at how well low-cost desktop publishing programs fared with this most difficult newsletter, turn the page.

of jump heads and the banner on page 1, were created in *Corel Draw!* and *Micrographx Designer*. These files were stored as .PCX, TIFF, .DRW, and .PIC. The most difficult file to import proved to be the pie chart on page 3, which we created in *Micrographx's Graph Plus* and saved as both .EPS and (an enormous) .PCX file.

The sample files were written in *Xy-Write* and stored as ASCII text. The text files were then converted to *Microsoft Word*, *WordPerfect*, *WordStar*, and *MultiMate* formats. The spreadsheets on page 3 of the newsletter were created in *Lotus 1-2-3*, then saved as .WK1, .WKS, .DIF, and .PRN files. We also converted the file to the .XLS

NEW LOGO FOR A NEW DECADE

BY JEFFREY MORRIS

The banner on this newsletter was a bit different to clients who have seen it before. The reason it features the new corporate logo of Westfield & Hampstead is that the company now allows itself to be officially referred to as W & H, ending decades of confusion during which every use called the firm W & H. The new logo was allowed to use the abbreviation non-officially as a course of corporate device.

The biggest change, of course, is that the company now allows itself to be officially referred to as W & H, ending decades of confusion during which every use called the firm W & H. The new logo was allowed to use the abbreviation non-officially as a course of corporate device.

For more information about Spatial Relations, please contact Sarah Tobias in the Spatial Relations Department of Westfield & Hampstead, at the Chicago office.

Explaining the new logo on page 4

Acquisitions: continued from page 1

Throughout its history, Spatial Relations has been a leading force in advocating open-plan designs for offices that allow for quick and easy reorganization and space allocation changes. In-house designers at the firm actually invented many of the room dividers and office furniture that you see in offices all over the world today.

Spatial Relations has also made a name for itself with innovative executive suite and boardroom designs that assert a company's identity forcefully yet with a great sense of style and taste.

Perhaps most famous are the brushed aluminum-walled executive floors that the firm designed for American Aluminum and Coal at the company's Pittsburgh headquarters. As it turns out, that

project was the first collaboration between Spatial Relations and Westfield & Hampstead.

Margaret Sallick and Catherine Clark, the maverick duo who started and currently run the company, will continue to head the operation as Spatial Relations becomes a division of Westfield & Hampstead. Spatial Relations' offices will relocate to a vacant floor at W & H's headquarters (the interior design firm will, of course, design its own offices), and all its 95 employees are expected to make the move.

For more information about Spatial Relations, please contact Sarah Tobias in the Spatial Relations Department of Westfield & Hampstead, at the Chicago office.

Stratton Leaves AW & P to Join W & H

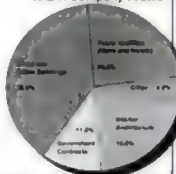
Alexander Stratton, who served as one of the top architects at Andrew Walters and Partners for 17 years, has left that position to join Westfield & Hampstead as a member of the Executive Board.

Stratton is best known as the architect of a series of office towers in Canada centers over during the 1970s. Examples of his work stand in Calgary, Edmonton, Vancouver, and Toronto.

Since 1982, Stratton has been turning his talents in large-scale shopping malls and hotel complexes in Houston, Dallas, Phoenix, and Los Angeles. Stratton will focus on this field by heading up a loosely organized division within W & H (see related story in Spatial Relations). If you're in Chicago and would like to set up an appointment to meet Stratton, give his office a call. He's eager to meet the W & H family of clients.

Richard Stanley

W & H Company Profile



Sick Buildings: Trouble Spots Worldwide

(Compiled by IAQE, International Association of Architects and Engineers)

	Chicago	New York	Los Angeles	London	Geneva	Paris
Median age of skyscrapers (years)	32.2	38.0	27.4	32.6	33.7	30.4
Life expectancy of ventilation systems (years)	22.8	24.2	17.6	25.3	28.1	25.7
Percentage with asbestos insulation	46.1	36.3	27.2	43.1	39.4	19.2
Percentage of energy-efficient units	22.1	21.8	30.7	12.4	47.8	24.6

The Witherspoon Building: New Efficiency

	1986	1987	1988	1989
Heating Jan-Apr	\$181,000	\$180,000	\$188,000	\$185,000
Air conditioning Jun-Aug	\$34,000	\$30,000	\$28,500	\$28,000
Ventilation-maintenance	\$12,000	\$9,000	\$9,000	\$9,000
Reused equipment-rentals	\$84,000	\$0	\$0	\$0
Plumbing-medical payments	\$103,000	\$0	\$0	\$0
Savings due to ventilation change	\$428,000	\$189,000	\$196,500	\$192,000

W & H QUARTERS

MIES VAN DER ROHE ITINERARY

March 13th: New York—Although the exhibit itself will be located on the second floor of the Metropolitan Museum of Art, the back-to reception sponsored by W & H will take place in the great hall. Contact: Jane Griffin.

May 7th: Chicago—The Art Institute of Chicago will provide a detailed and very informative guided tour of the Mies exhibit. Contact: Rayn Higgins.

July 13th: Los Angeles—The

Itinerary starting at 11 a.m. A garden luncheon will celebrate the opening of the show and the beginning of spring. Contact: Rayn Higgins.

Museum of Contemporary Art will be the setting for a spectacular audiovisual presentation, where viewers will be transported from the Mies exhibit to the actual buildings on location. A champagne buffet follows. Contact: Margaret Hayes.

September 8th: London—A private ship-noon viewing at the Tate Gallery and high tea will introduce the British audience to the exhibition. Contact: Penelope Witherspoon.

WESTFIELD & HAMPSTEAD

The original Westfield and Hampstead logo conveyed a traditional approach to architectural design. The new logo means a more forward statement.

New Logo: continued from page 2

philosophy behind the new logo. Communications Director Michael Moore said, "It's really simple. We wanted to launch ourselves into the 21st century with a new look that expresses the dynamism of the firm."

changed last week with neither fanfare nor nostalgia. "It's not like NBC killing the peacock or something," Moore said. "It's all just a part of the firm's growth and evolution."

Doing Good: continued from page 2

highlights those cities in which W & H maintains a regional office and lists the event coordinator to whom preliminary guest lists should be sent.

Although "Jules: Artist and Architect," as the exhibition is called, is the first to be funded by W & H, it won't be the last. According to W & H public relations liaison Elizabeth Wason, the firm is thrilled to have its name associated with a quality show like this one, and in the future we'll be looking for more opportunities to get architecture the kind of museum-based attention it deserves.

W & H KLEINMAN: Pro Bono Architect. More usually associated with the legal profession, pro bono work is becoming common in other disciplines as well—especially architecture. As part of a federally funded, award-winning project, W & H senior designer Jacob Kleinman recently helped restore a small 5-story apartment building in New York's East Village.

As a housing member of the not-for-profit group Independent Housing, Kleinman salvaged an otherwise sound building with a new roof and reorganized the turn-of-the-century railroad apartments into more livable, centrally organized units. According to Kleinman, "I get professional satisfaction from my work on larger office complexes, but seeing these families move into apartments that they helped build is a task that can't be described."

W & H QUARTERS

DESKTOP PUBLISHING LOW-END PROGRAMS

MEMORY LIMITATIONS

Express Publisher imports files from *WordPerfect*, *Wordstar 2000*, *Microsoft Word*, and *Microsoft Works*—unless the file requires more than 64K RAM, as PC Labs' 25-page test file did. In this case, *Express Publisher* gives you an error message.

Instead of swapping text to disk or accessing expanded memory, *Express Publisher* keeps imported text files in conventional RAM. So while the program's 32-page document limit and auto-flow feature let you create long documents, you can't import long stories. Rather, you must append smaller text files in sequence, increasing a document's length in increments to suit memory restrictions.

The 64K RAM limitation applies to the graphics files the software imports: .IMG, .PCX, .MAC, and .ART. These formats are saved as part of an *Express Publisher* document; thus they can be magnified,

SUITABILITY TO TASK

EXPRESS PUBLISHER

	1	2	3	4
Four-page newsletter				
Three-fold brochure, heavy graphics				
Medium-length document				
Internal report or memo				

cropped, rotated, inverted, or flipped within the program.

Express Publisher does not apply this memory constraint to high-resolution graphics (with greater RAM requirements), such as TIFF, .GIF, and .EPS. Though supported, these formats are not imported by *Express Publisher*; instead, the program points to a file's external location. As a result, many of the graphics editing functions are unavailable for images in these formats.

Express Publisher displayed intolerance of the PC Labs test's TIFF files, which consist of scanned images and logos created in mainstream programs like *Micrographix Designer* and *Corel Draw!*. Admittedly, TIFF images can be problematic, but using a standard utility program to convert the images to more-acceptable formats like .GIF and .PCX produced erratic results.

The only foolproof workaround proved

Express Publisher

Not Just Doing Well...DOING GOOD

BY CATHERINE CORBETT

Three thousand beneficiaries have in Chicago, Illinois. The Scholarship Foundation has provided the sixth annual Winfield Scholarship to a fortunate favorite.

Charles Young, a 25-year-old Chicago native who attended Northwestern University and is currently completing graduate studies in architecture at the University of Chicago, will receive the \$20,000 prize. The award is made annually to the most promising young architect studying in any United States graduate school of architecture.

Young supported 45 other architecture students representing 41 schools of architecture, all of whom had completed detailed plans for a facilities expansion project.

"It's difficult," Young said when told of his prize, "to be the obvious reason that it's a great honor and for the pragmatic reason that now I can start my career in the field."

Young jokingly described his architectural style as "representative of the traditional appeal on Postcard-landscapes in my design. I tend to reveal heavy decorative treatment on commercial buildings," he said. "I want my buildings to speak easily and let the people inside carry the big loads."

But Young went into a business. The most successful local sales in W & H history took place when the 320th volume, published his art in a Red Cross laboratory. W & H has run a third donor program for

over a decade, but this year employees at corporate headquarters in Chicago responded to the city's critically depleted blood supply with unequaled generosity—surpassing the target goal of 400 donors by more than 30 percent.

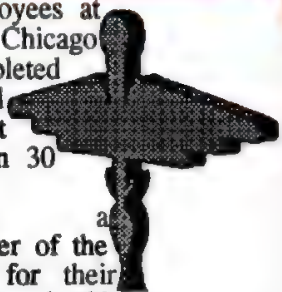
Anthony Giacometti, representative from the local chapter of the Red Cross, praised the donors for their altruism, and Carol Nixon—the health benefits coordinator here at W & H—for her organizational skill. "The simple truth is that Miss Nixon, and all of the other volunteers, will save people's lives. We're very grateful for their help."

W & H is a member of the American Hospital Association. Winfield & Hospital has announced its sponsorship of a major blood drive for the next two years. The collection, which includes 50 original sketches and drawings, 50 photographs, and 21 scale models, will be displayed at the Metropolitan Museum of Art in New York, the Museum of Chicago, and the Museum of Contemporary Art in Los Angeles. Following the American tour, the exhibition, which was designed and assembled by a consortium of architects and engineers from around the country, will travel to London's Tate Gallery and the Centre de Pompidou in Paris.

Each museum on the itinerary will fund its own segment of the exhibition, but W & H will cover all the shipping and overhead costs. In each city, a series of gala previews will be organized, and W & H will receive

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Making Sick Buildings Well: Common Sense, Financial Sense

BY CLAIRE GIBSON

Newspapers are full of reports about companies suffering productivity declines and increasing absenteeism attributed to poor lighting and ventilation in offices. It's no secret that some skyscraper ventilation systems more than 15 years old tend to be out of control and inefficient and redesigned as well (Figure 1).

A good example can be found in the landmark 30-story Winthrop building, located not far from W & H's headquarters in Chicago. When the new system took over the building in 1985, it was only a matter of weeks before brown coughs began pouring in.

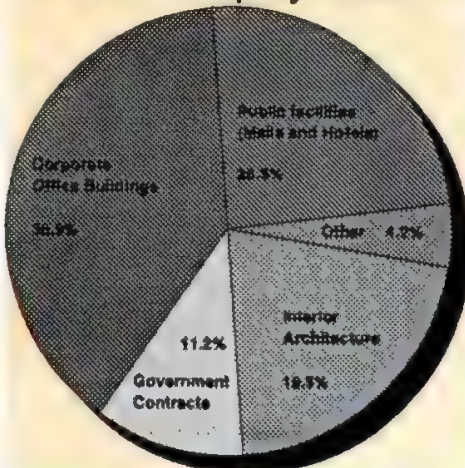
Architects immediately had been returned from the building to early in 1975, but when expressed concerns that the ventilation system was slow, inefficient, and dangerous.

A design team from W & H was able to diagnose the air-flow problem and plan an entirely new system that maintained air circulation in a matter of weeks. The new system, which became operational in December 1986, was installed in less than a year.

While they were at it, the architects also suggested that new floor-to-ceiling windows be installed on every floor of the building, replacing windows dating from 1945. Through the new windows took so difficult to locate (or architecture critics), they were approximately \$400,000 a year in heating costs by keeping the cold air out.

In summer, the windows also keep the cold air in, and the sun-air-conditioning system, which circulates air through the W & H-designed ducts.

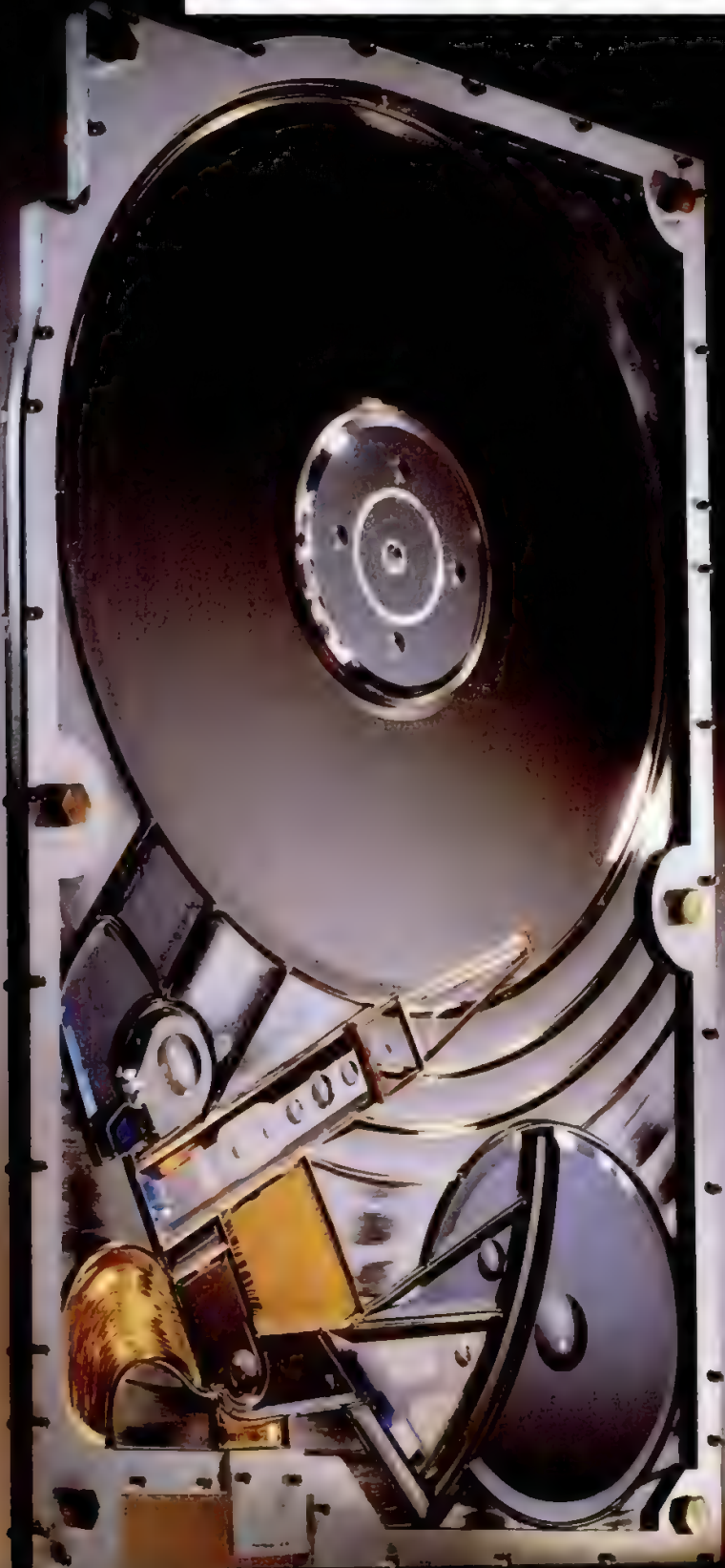
W & H Company Profile



Although *Express Publisher* did successfully import the medical symbol as a .PCX file, there are several problems with the text wrap. The hyphenation algorithm sometimes does a poor job—look at the loose spacing around the name Anthony Giacometti. In addition, the distance between the text and the graphic is determined by the margin setting for the entire frame. Here, I opted for no margins, which resulted in having the text print too close to the graphic.

Express Publisher was the only program in our roundup that could handle the pie chart on page 3. However, it could not print this file in the HP version of the newsletter because the .PCX version exceeded the program's memory limits. However, the .EPS file (if you can use PostScript drivers) worked like a charm.

THE FINE ART OF DISC DRIVES



Even to the experienced observer, a disc drive is a technological marvel. With discs spinning at 60 revolutions per second, the mechanics involved are astounding. It takes a company with a unique level of skill and experience to produce drives in volume that perform reliably year after year. A company like Seagate.

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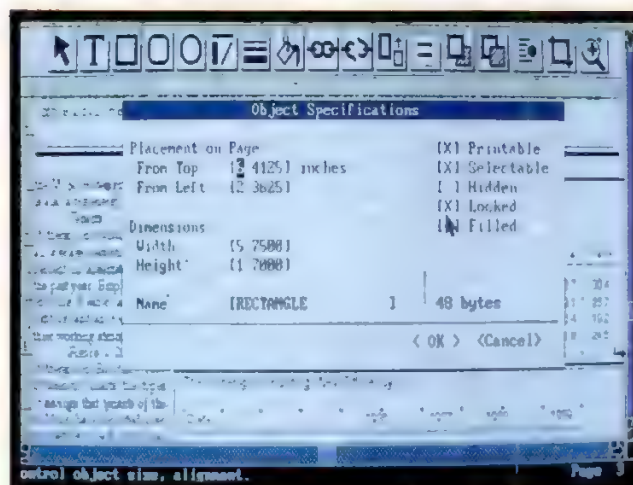
CIRCLE 736 ON READER SERVICE CARD

to be translating to the .EPS (Encapsulated PostScript) format, which relies upon the printer's PostScript interpreter to manipulate the graphic information it contains. *Express Publisher's* support of the EPS format gives users access to high-resolution vector graphics and also provides a handy way to overcome file format compatibility problems. Once converted to EPS, *Express Publisher* passed our test TIFF images (now encapsulated) to the printer without a hitch.

INTELLIGENT INTELLIFONTS

Express Publisher takes full advantage of Agfa Compugraphic's font technology, and it comes with two totally scalable typefaces, CG Times and CG Triumvirate, which closely resemble Times Roman and Helvetica. Although the letter forms are not as aesthetically pleasing as Bitstream fonts, *Express Publisher's* ability to scale these typefaces interactively from within

DESKTOP PUBLISHING LOW-END PROGRAMS



The Object Specs dialog box in *Express Publisher* allows you to determine the status of the currently selected frame, making it printable, selectable, fillable, hidden, or locked. Locking is especially useful if you wish to preserve complex layouts.

the program is a blessing.

Best of all, there are no separate or complicated procedures to install these

downloadable fonts: once the DTP program is installed, the typefaces—scalable from 6 to 144 points—are at your finger-

Finesse

Finesse handles reverse type in text mode, preserving the resolution of downloadable fonts. Creating the hanging indents in the text body requires only that you indicate a left indent for the paragraph style (the first line of every paragraph always maintains its own indent information).

ITINERARY

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Maureen Hayes
September 6th:
London--A pri-
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Not Just Doing Well ... DOING GOOD

BY CATHERINE CORSETT

South Westfield Suburbans Office in Chicago (top) and the city's critically acclaimed award-winning supply with unparalleled generosity surpassing the target goal of \$500,000 in more than 10 years.



Each time you see the structure will have an even more of the children, but W & H will cover all the shipping and overhead costs. In each city a work of good people will be required. In each city W & H will receive complimentary letters as well as their cover copies of the show's heavily illustrated catalog. The actual printing is handled by combination of the Chicago and New York offices. Each time you see W & H maintains a regional office, and from the

Making Sick Buildings Well: Common Sense, Financial Sense

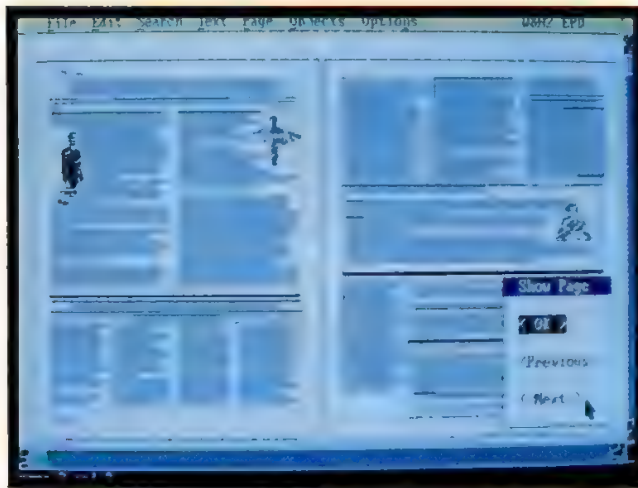
BY CLAUDE GIBSON

Newsprinters are full of it. In the past, they have been the most profitable and most successful in the industry. But now, they are the most troubled and most financially distressed. The industry is in a state of crisis, and the newsprinters are the ones who are most affected. The industry is in a state of crisis, and the newsprinters are the ones who are most affected. The industry is in a state of crisis, and the newsprinters are the ones who are most affected.

Although *Finesse's* internal conversion utility was unable to interpret our TIFF images, we had no trouble importing this test logo once we converted it to .IMG with *Hijaak*. *Finesse* can insert special characters (like the bullets near the locations of W&H's regional offices) into text; the selection, however, is limited. Here we used round instead of square bullets.

DESKTOP PUBLISHING LOW-END PROGRAMS

The full-page view in *Express Publisher* is totally static. You cannot select, resize, or reposition any of the elements on the page. In fact, you can't even reposition the dialog box that obscures the lower-right-hand corner of your document.



tips. *Express Publisher*'s typefaces can be expanded with three additional Compu-graphic packages (\$59.95 each).

But you may not find it necessary to purchase additional software typefaces because *Express Publisher* does a good job

of supporting any fonts that may be resident in your printer's ROM. For example, the installation menu lists every possible cartridge variation for the HP LaserJet. In addition, *Express Publisher* will access standard PostScript typefaces for Apple LaserWriters and compatibles. And though you will have to live without true screen equivalents, the program will also utilize any downloaded Adobe fonts resident in the printer's memory.

You can load an impressive 20 printer drivers during installation, making it a snap to switch between printers. Unfortunately, some drivers were buggy. Files that contained downloaded fonts printed out beautifully on an HP LaserJet Series II but were garbled on earlier models like the original LaserJet or the LaserJet Plus.

Express Publisher gets a lot of mileage out of high-quality fonts with sophisticated features like kerning, full justification, paragraph styles, and discretionary hy-

GEM Desktop Publisher

W&H Not Just Doing Well... DOING GOOD

BY CATHERINE CORSETT

Worldwide Humanitarianism is a Chicago tradition. The Scholastic Submissions of the World's Most Famous Humanitarian Award has awarded the most famous World's Most Famous Humanitarian Award to a Chicagoan.

Charles Young, a 25-year-old Chicago native who attended Northwestern University and is currently completing graduate studies in architecture at the University of Chicago, will receive the \$25,000 prize. The award is made annually to the most promising young architect working in any United States graduate school of architecture.

Young's project, "The shelter," is a design for a shelter for the homeless. Young's design is a design for a shelter for the homeless. Young's design is a design for a shelter for the homeless. Young's design is a design for a shelter for the homeless.

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myriad headquarters in Chicago responded to the city's critically depleted blood supply with equal passion: organizing the largest pool of 400 donors by more than 30 percent. Anthony Ciccarelli, a representative from the local chapter of the Red Cross, praised the donors for their devotion, and Carol Hines—the health benefits coordinator here at W & H—for her organizational skill. "The single truth is that this is, and all of the other volunteers, will save people's lives. We're very grateful for their help."

W & H to represent Chicago's humanitarianism. Worldwide Humanitarianism is a Chicago tradition. The Scholastic Submissions of the World's Most Famous Humanitarian Award has awarded the most famous World's Most Famous Humanitarian Award to a Chicagoan.

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GEM Desktop Publisher exhibited some very unusual justification techniques: notice the first and last lines of this text sample, which are both short by several characters.

Each museum on the itinerary will fund its own mounting of the exhibition, but W & H will cover all the shipping and overhead costs. In each city, a series of gala previews will be organized; clients of W & H will receive complimentary tickets as well as hard-cover copies of the show's lavishly illustrated catalog. The accompanying schedule of exhibition dates (located on page 4) highlights

Sick Buildings: Trouble Spots Worldwide

(Compiled by IAEE: International Association of Architects and Engineers)

	Chicago	New York	Los Angeles
Median age of skyscrapers (years)	32.2	38.0	27.1
Life expectancy of ventilation systems	22.6	24.2	17.1
Percentage with asbestos insulation	46.1	34.5	27.1
Percentage of energy efficient units	22.1	21.9	30.1

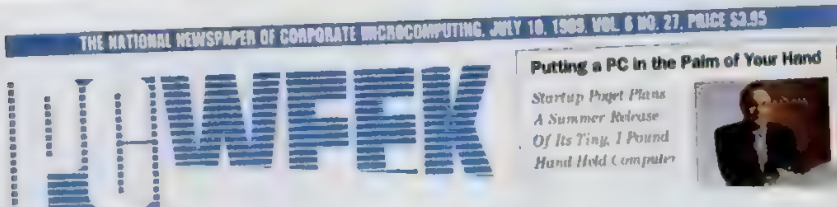
GEM Desktop Publisher has the capabilities to do complicated tables. Not only does the program allow you to combine right, left, center, and decimal alignment, but interactive kerning helped when the time came to fit all of the labels on one line.

When buying business graphics software, look out for number one.



Freelance Plus
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Freelance Plus
Best Rated Presentation
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Top Ranked Desktop
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Freelance Plus
Best Buy
Graphics Program
November, 1989



The industry experts have put their stamp of approval on the new Lotus® Freelance® Plus. In fact, their rave reviews call it the best business graphics software on the market.

It's easy to see why. Freelance Plus gives you all the tools you need to easily create outstanding business presentations—now using less memory than before.

And it works better with Lotus 1-2-3* than

any other presentation graphics package.

Call 1-800-345-1043 today for a free Freelance Plus demo kit.* Ask for DCA-1678.

And you'll see for yourself that the best way to look out for number one, is to buy #1.

Lotus Freelance Plus



*For more information on upgrading to Freelance Plus 1.01 call 1-800 TRADE P. © 1990 Lotus Development Corporation. Lotus 1-2-3 is a registered trademark of Lotus Development Corporation.

Usually, the technology available to computer users just plods along—with competing products repeating one another's so-called improvements.

But once in a blue moon there's a great leap of innovation. Something new appears that's so well thought out, so

smart, that the way you work may never be the same again.

WIZ™ by CalComp, for example.

WIZ is an exciting new productivity tool. Combining the easy-to-use features of a mouse with the power of an "intelligent" graphics pad to enhance every pointing, tracing

and drawing function you do.

WIZ meets the needs of virtually every Macintosh and PC user—from novice to advanced. Because WIZ gives you the convenience and flexibility of six programmable buttons, a cross-hair pointer and 1000 dpi for pinpoint accuracy, along with

Prehistoric.



a user-definable mouse area.

What's more, WIZ unleashes the full power and speed of your software. Optional templates for most major programs eliminate tedious pull-down or bar menus. Because WIZ templates put the commands you use most at your fingertips for

instant access. And for the artist in you, WIZ offers an optional pen for drawing.

There's no rolling ball or moving parts. Nothing to clean. And WIZ has a five year warranty backed by CalComp, a world leader in computer graphics for over 30 years.

But the most amazing thing about WIZ is that you get it all for an introductory price under \$200.

See WIZ at your local dealer or call 800-CALCOMP.

WIZ by CalComp. Everything else is just a mouse.



Historic.



CIRCLE 144 ON READER SERVICE CARD

phens. Like many of its low-end DTP competitors, *Express Publisher* uses frames to manage text flow. These tools, along with the ability to link noncontiguous text frames, made short work of the text and layout portions of our newsletter.

LEARNING BY EXAMPLE

The program attempts to shield users from desktop publishing's complex processes. For example, creating a new paragraph style requires that you modify a text block within the document and assign a name to the new style. This makes for a concrete, visual process that novices will appreciate.

Instead of using a numeric value (10-point type on 11 points of leading) to determine line spacing, this package has a dialog box that lets you indicate when you want more or less spacing. However, by showing you only one letter—and that a capital T—*Express Publisher* makes it difficult to judge the position of the ascenders

DESKTOP PUBLISHING LOW-END PROGRAMS



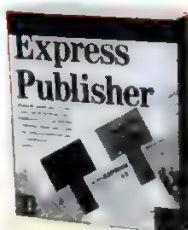
FACT FILE

**Express Publisher,
Version 1.0**
Power Up Software
Corp., 2929 Campus
Dr., San Mateo, CA
94403; (800) 851-2917,
(800) 223-1479 (CA
only), (415) 345-5900.
List Price: \$149.95.

Requires: 640K RAM; 2MB free disk space;
DOS 3.0 or later; CGA, EGA, VGA, MCGA,
Compaq, or Hercules graphics adapter; mouse.

In Short: *Express Publisher* does a wonderful
job of putting high-quality typefaces into the
hands of novice users. Documents with lots of
text formatting should be a breeze. However,
flawed implementations of otherwise powerful
tools make it difficult and frustrating to create
complex, image-laden documents.

CIRCLE 413 ON READER SERVICE CARD



in relation to the descenders on the previous line.

Another powerful but flawed feature is the Objects Spec box. You can precisely size and position frames using this, and the ability to lock a frame's attributes can protect complicated layouts from accidental changes. Unfortunately, locking a text frame destroys text wraps.

The powerful kerning feature is automatic, but because it is applied only to copy blocks there is no way to adjust individual letter pairs in a headline. And the visual interactive method for setting tabs does not support right and center tabs.

When *Express Publisher* works well—notably in layout and type-handling functions—it displays a new vision for easy-to-use desktop publishing programs. At the moment, however, several tools of dubious value and frustrating problems with graphics import obscure this otherwise interesting and capable product.

PageBuilder

The use of exclusion boxes allows you to reserve space in your layout for graphics files. Here the type wraps around a .PCX file (which is the only file format that *PageBuilder* currently supports).

Success...The most
H history ended last

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loyees at

go responded to the
pply with unequalled
goal of 400 donors



Not Just Doing Well...DOING GOOD

BY CATHERINE CORBETT

Tom Wolford Scholarship Case in Chicago
figure. The Scholarship Foundation of the
Wolford & Wolford Foundation Board has
awarded the Wolford Scholarship to a
Chicago native.

Charles Young, a 25-year-old Chicago
native who attended Northwestern University
and is currently completing graduate
studies in architecture at the University of
Chicago, will receive the \$20,000 prize.

The award is made annually to the most promising
young architect studying in any United States
program at a level of architecture.
Young competed against 45 other architects
submitting 41 sheets of architectural
drawings. Young had completed several plans for
a new residence addition project.
"I'm thrilled," Young said after word of his prize.
"Both for the obvious reason that it's a great honor
and for the pragmatic reason that now I can start my
career in the field."

Young's design described his architectural style as
"representative of the traditional style of
postmodernism in my design. I used to avoid
any accurate treatment on commercial
buildings, he said. "I want my buildings to speak
and let the people make their own decisions."

Wolford Blood Drive a Success. The most
successful blood drive in W & H history ended
last year with 400 donors.

Wolford Blood Drive a Success. The most
successful blood drive in W & H history ended
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Wolford Blood Drive a Success. The most
successful blood drive in W & H history ended
last year with 400 donors.

Common Sense, Financial Sense, Making Sick Buildings Well

BY CLAIRE GIBSON

Newspapers are full of from W & H's office problems and to tenants (or
regards about companies headquarters in Chicago plan an entirely new architecture crisis).
suffering production. When its new camera took system that mandated 10 days. A new
declines and increasing over the building in 1985 new construction in a 30-story, 1.5 million
obsession attributed to it was only a matter of matter of weeks. The new \$40,000,000, 15-year
poor lighting and waste safety instant system which became in heating costs by
construction in offices. It's complete began pouring completed in December keeping the cost at
no secret that some in
sheltered ventilation
Admission ventilation had been removed from the office they were at, the
systems more than 25 been removed from the office they were at, the
plans are used to be not building as early as 1975 architect and suggested cold air in the new
only replaced but but tenants expressed that new thermal air-conditioning system
control. But the windows designed on which circulate air
as well as figure 11
ventilation system was every floor of the through the W &
A good design can be dirty inefficient, and building replacing n-designed ducts in
found at the building designed.
3-story Westborough
design team from W & H 1984. Though the new Tenants at the
building, located not far was able to diagnose the windows kept the different Westborough building

PATIAL RE ARCHITEC BY RICH



Though *PageBuilder* had no trouble with simple .PCX files, it could not interpret any of the test's scanned images. Though you are restricted to *PageBuilder*'s internal fonts, they are high-resolution bitmaps, as you can see from the headline copy here.



ALL PLUS, NO MINUS. Introducing the Plus Series from GoldStar. A new family of seven color monitors that qualitatively and quantitatively add up in more than a few areas.  The Plus Series unites the latest in technology with a completely new design that is functional yet elegant.  The controls move to their most logical place, the front. We also designed slide control levels for brightness/contrast. And made the entire family very, very easy on the eyes. With sharp definition, clean design and inviting colors.  They're here now, complete with a very appealing price and a free set of wipes to keep them sharp. Visit your GoldStar dealer today.  Check his addition, then ask for the Plus.

Model	Description	Resolution	Maximum Resolution
1410 Plus	14" 0.51	CGA	640 x 200
1420 Plus	14" 0.39	EGA	640 x 350
1425 Plus	14" 0.39	VGA	640 x 480
1430 Plus	14" 0.31	VGA	640 x 480
1450 Plus	14" 0.31	VGA/SuperVGA	800 x 600
1460 Plus	14" 0.28	VGA/SuperVGA/8514A	1024 x 768*
1610 Plus	16" 0.31	VGA/SuperVGA/8514A	1024 x 768*

*Interlaced Mode

The Plus family works with all IBM® PCs. The 1450 Plus works with both IBM and Apple® Macintosh®.



GoldStar

CIRCLE 233 ON READER SERVICE CARD

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DESKTOP PUBLISHING LOW-END PROGRAMS

Finesse

by Robin Raskin

SUITABILITY TO TASK				
FINESSE				
	1	2	3	4
Four-page newsletter				
Three-fold brochure, heavy graphics				
Medium-length document				
Internal report or memo				

At \$179, *Finesse* adds a touch of class to low-end desktop publishing software. Issues of cost aside, this program's remarkably intuitive user interface makes the integration of text and graphics an elegant affair.

Logitech has bundled a generous selection of four high-resolution, scalable Bitstream fonts (Dutch, Swiss, Courier, and Symbol) with the program, along with the requisite font installation kit for GEM, Version 1.1. The *Finesse* manual thoroughly documents the font installation procedure—a striking change from many programs that rely on Bitstream's more generic, less useful renditions.

Finesse includes a variety of tools that do justice to these good-looking fonts. In-

dividual letter pairs can be kerned, and a hyphenation algorithm makes ragged-right columns look professionally set. You can even copy a format, such as the type style and indent, from one paragraph to another.

Unfortunately, confusion reigns regarding the creation of bold and italic fonts. You can assign boldface or italics to any font in your document. But if *Finesse* is unable to locate a true bold or italic Bitstream font, it substitutes its own markedly inferior text attributes. The end result is an inconsistent look for otherwise high-quality text.

No such consistency problems plague the user interface. A single menu line across the top of the uncluttered screen contains all commands, executed with the mouse or by using speedier keyboard equivalents. Menus allow you to invoke the automatic text wrap, provide eight interesting fill patterns, and shuffle objects in front of or behind one another.

PFS:First Publisher

W&H QUARTERLY

Not Just Doing Well...DOING GOOD

Youth World's Best Building...
 ...the most successful building...
 ...the most successful building...
 ...the most successful building...

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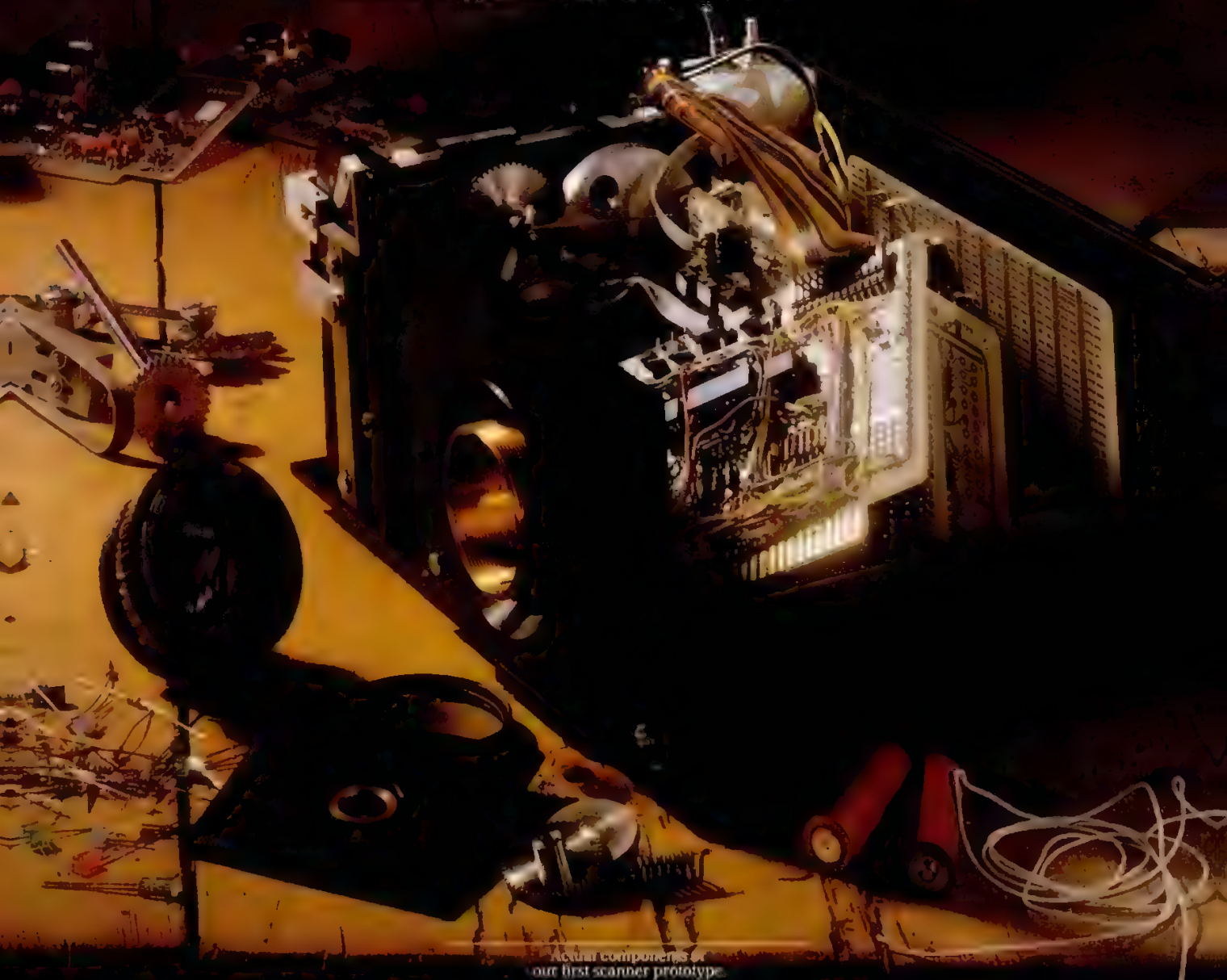
Although *PFS:First Publisher* can handle high-quality type, to place the continued lines, you'll have to rely on text entered in graphics mode in order to keep the copy out of text flow. The 72-dpi type, intermingled with high-quality HP fonts, produced erratic quality in the document overall.

Doing Good, continued from page 2

is called, is the first to be funded by last. According to W&H public relations, "The firm is thrilled to have with a quality show like this one, and looking for more opportunities to get of museum-based attention it deserves

XEROX

After having
invented the
scanner...



Actual components of
our first scanner prototype.

In the '70s, Datacopy invented the first electronic digitized camera. And Kurzweil invented the first reading machine for the blind. Xerox Imaging Systems is the combination of those two companies. We've had more to do with the invention of scanning than anyone.

As a result, we've had more experience to help us develop better scanning solutions. And we bring you more of them, from image to text, low-end to high-end, Mac to PC (or PS/2), than anyone else. See for yourself.

Solving your scanning problem should be a snap.

And when you show AccuText a document, it will reconstruct its format automatically, more precisely than virtually any other OCR product. It's almost like photocopying onto your screen.

There's no simpler way to get almost any document into the most popular word-processing, spreadsheet, database or publishing programs.

The big value in text scanning.

With its artificial intelligence-based Kurzweil text recognition, the Discover Model 30 is an outstanding value.

Like our top-of-the-line K 5100, it accurately recognizes thousands of typestyles, multi-columns, landscape documents, graphics mixed with text—and many other “real world” documents that give traditional scanners trouble.

The Model 30 also has an optional 30-page document feeder, and several features to handle larger workloads.

Load a stack of documents, and it will scan each automatically into its own file.

You can also store pages quickly as images, and save recognition for a more convenient, off-peak time.

This kind of power and range make it the top-performing scanner in its class.

The smartest scanner for heavy workloads.

The Kurzweil 5100 is our top-of-the-line scanner for high volume, high accuracy work.

Its predecessor, the K 5000, was named an Editor's Choice by *PC Magazine*. In a 33-page comparison of scanners, they called it “unbeatable.”

The K 5100 has all the K 5000's strengths. Its Kurzweil ICR gives you the most accurate recognition, over the widest range of documents, of any scanner on the market.

What the K 5100 adds is an interactive Text Verifier. This lets you teach the scanner the rare character it can't learn automatically, such as an engineering symbol. Your answer increases automatic recognition. As a result, you can scan much material outside the reach of other scanners.

The K 5100 is also a work-horse. Its durability is unmatched in the industry.



AccuText

Make your scanner read what it never could before.

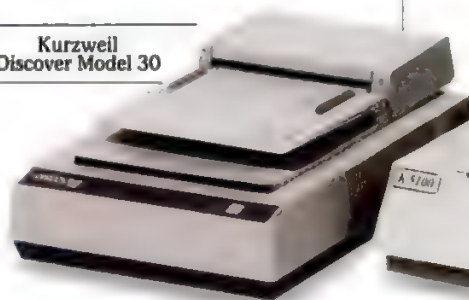
Go beyond the range of OCR with AccuText. It brings the power of omnifont Intelligent Character Recognition (ICR) to the most popular scanners, and your Apple Macintosh.

And unlike other OCR products, AccuText is one of the first true applications of artificial intelligence.

Scan thousands of different typestyles, and AccuText will learn them automatically and recognize them forever. It gives you the most accurate document recognition available on the Macintosh.

Even scan a facsimile or poor quality photocopy and AccuText will decipher it.

Kurzweil
Discover Model 30

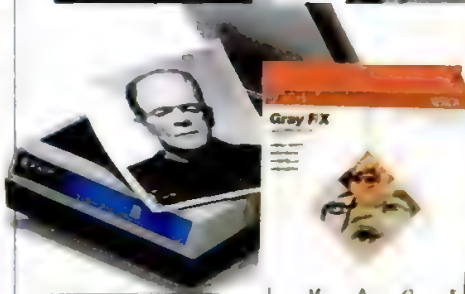
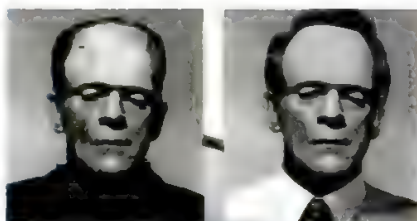


Kurzweil 5100



It has the ease of a 50-page feeder. And an angled bookedge, to make scanning bound material easier.

It has a number of other features to make high production scanning a snap. Ask us to show you.



Gray F/X

Grayscale special effects.

Even if you're up against a publishing deadline, you can now retouch photographs and artwork right on your screen, with more control and a quicker turnaround than ever before.

Gray F/X makes your PC into the equivalent of a professional photolab.

With your mouse, and simple window menuing, you can remove or cover mistakes. Merge multiple images. Shrink. Enlarge. Improve contrast. Modify with an assortment of air-brushes. And work with a number of other tools and special effects.

Unlike other photo manipulation programs that just do a lot of "tricks," Gray F/X is first on the PC to give you the range of control and subtlety necessary for high-quality photo output.

The delay, and expense, of sending out for retouching belong to the past.

Capture images for publishing.

Now you can quickly scan images directly into the most popular desktop

publishing programs, without having to exit your application. Thanks to four new utilities.

ImageCopy works with all publishing and graphics programs on the Apple Macintosh. VP•Mate supports Xerox Ventura Publisher 2.0. And Page•Mate works with Microsoft Windows and Aldus PageMaker 3.0. PM•Mate works with OS/2 Presentation Manager versions of PageMaker and Ventura Publisher.

When you are not running a publishing program, use MacImage software to capture images with any Datacopy scanner, and your Macintosh. Or PC Image with Datacopy scanner, Microsoft Windows and your PC, PS/2, or compatible.

Both programs give you a number of ways to enhance framing, contrast and halftones.



ImageCopy, Page•Mate, VP•Mate, MacImage, PC Image, PM•Mate

If you have our MicroFax PC fax board, you can even import images by phone.

We make it simpler than ever to give a great image to your work.

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SL

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PC Magazine [July 1989, Page 263]:

"The Buffalo SL peripheral sharing device is simple enough to use immediately yet sufficiently flexible to form the center of a fairly complex network. It's a good choice..."

The SL Saves Money By Sharing Resources

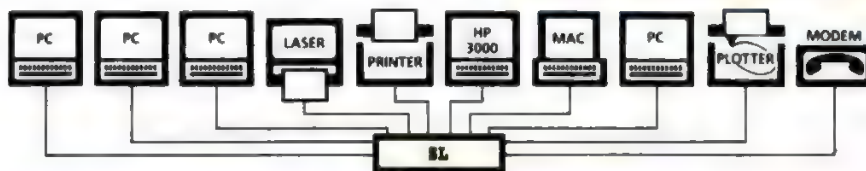
When you can't afford to buy a laser for each PC, using the SL™ is the inexpensive way to let everyone share—not just your lasers, but printers, plotters and modems as well. You will get more efficient use of your peripherals because greater access by more users reduces unproductive idle time and the need to purchase more of these expensive peripherals. The SL is an alternative to a LAN at a fraction of the cost.

SL Increases Office Efficiency and Productivity

An SL with memory improves PC productivity by allowing all users to simultaneously send their print jobs and quickly release their PCs to continue working without being delayed by slow printers or others using the printer. Memory in the SL is a more sensible investment than additional memory in each printer since SL memory is shared by all users and all peripherals.

- **Ten Channels:** four parallel and six serial, all can be software configured as either input or output; automatic conversion from parallel to serial, serial to parallel, or serial to serial parameters; automatic switching and queuing of jobs
- **115,200 bps:** our software allows virtually all PC applications to send data serially to the SL much faster than parallel and 12 times faster than normal 9,600 bps serial; PC to PC file transfer serially at 115,200 bps
- **Pop-up Menu Via Hotkeys:** keyboard selection of printers, macros and many other control functions; optional TSR uses only 33K maximum conventional memory overhead compared with a LAN which typically uses more than 150K
- **Simple Installation:** just plug in the cables and run the menu-driven installation software for the Pop-up Menu
- **User Upgradable Memory:** from 0 to 4MB buffer
- **45 Day Money Back Satisfaction Guaranteed**

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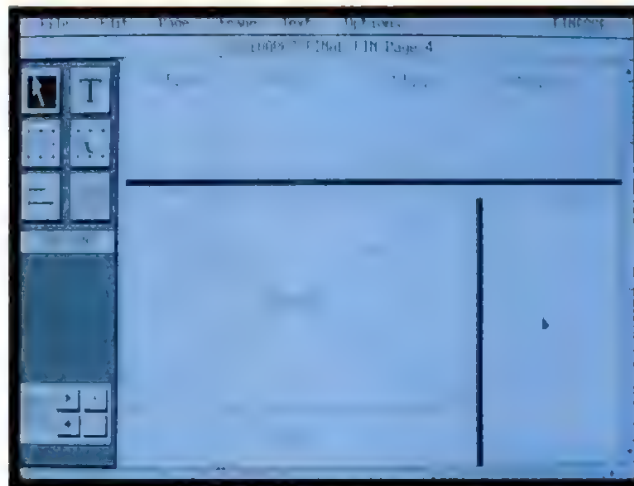
CIRCLE 328 ON READER SERVICE CARD

The left side of the screen contains icons that allow you to add or move through pages, as well as tool and option boxes. Click on a tool, and you can create text or graphics frames, draw lines or boxes, and chain frames together.

FRAMEWORTHY DOCUMENTS

Frames (self-contained units of graphics or text) are the backbone of a *Finesse* document. Once you've drawn a rectangular frame with the text tool, your copy—either typed or imported—pours into that box. Frames can be resized, moved, and chained together.

Chaining allows *Finesse* to accommodate multiple story threads. Its ability to link frames and thereby flow moderate-sized stories from one page to the next is a real showstopper. Don't worry if your story is larger than the box you've drawn; a cautionary icon will appear in the corner of the frame to alert you to text overflow. Our



Ctrl-T invokes a special mode in *Finesse* in which only the filenames and the sequence of linked frames in a story are displayed. Still in an interactive mode, all the frames can be moved or resized. Turning off the graphics display in the options menu speeds up the program's response time.

testing revealed, however, that very long text files—exceeding *Finesse*'s 16-page limit—will generate a fatal error message.

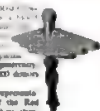
Whenever you create a frame, an option box pops up to supply all toolbox-dependent suboptions, making it difficult

Publish It!

Not Just Doing Well...Doing Good

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99

Fourth, Donald W. Buchanan, Chairman, Graduate School of Architecture, University of Chicago, will receive the \$20,000 prize. The award is made annually to the most promising young architect studying in any United States graduate school of architecture.

[illegible]

60 other architectural students representing 61 schools of architecture, all of whom had completed detailed plans for a fictional residential addition project.

Cross, praised the drivers for their altruism, and Carol Munn, the health benefits coordinator here at W & H for her organizational skill. "The simple truth is that Miss Munn, and all of the other volunteers, will save people's lives. We're very grateful for



"I'm thrilled," Young said upon word of his prize. "But for the obvious reason that it's a great honor and for the pragmatic reason that now I can start my career on the black."

Young previously described his commitment to write as representative of the traditional motto on Post-It notes in my design. I tried to avoid heavy, decorative treatment

W & H to **Support Major Urban Retrosppectives.** A major effort Hasenbach has undertaken in sponsorship of a superb list of retrospectives exhibits that will travel to art museums in three countries over the next two years. The collection, which includes 90 original sketches and drawings, 50 photographs, and 21 scale models, will be displayed at the Metropolitan Museum of Art in New York, the Art Institute of Chicago, and the Museum of Contemporary Art in Los Angeles following the American tour. The exhibition, which was designed and assembled by a consortium of architects and curators from around the country, will travel to London's Tate

and commercial buildings," he said. "I want my buildings to speak softly and let the people inside carry the big sticks."

Each museum on the itinerary will hold an evening of the exhibition, but W & H will cover all the

Making Sick Buildings Well: Common Sense, Financial Sense

BY CLAIRE GIBSON

Newspapers are full of reports about companies suffering productivity declines and increasing absenteeism attributed to poor lighting and ventilation in offices. It's no secret that some skyscraper ventilation systems more than 25 years old need to be not only replaced but redesigned and redesigned as well.

ing, located not far from W. A. H.'s headquarters in Chicago. When the new owners took over the building in 1985, it was only a matter of weeks before tenant complaints began pouring in.

With it was able to diagnose the air-flow problems and plan an entirely new system that minimized new construction in a matter of weeks. The new system, which became operational in December 1966, was installed in less than a year.

1966. Through the new windows there is no difference in treatments of architecture critics. They save approximately \$40,000 to \$50,000 a year in heating costs by keeping the cold air out.

To summarize, the windows also keep the cold air out and the new air conditioning system, which is completely automatic, saves the \$100,000.

A good example can be found at the lanterns

மேலும், இவ்வுத்தரத்தின்படி, கீழ்க்கண்ட
பணம் கீழ்க்கண்ட, அமைதிப்படைகள், அமைதி
படைகளாகும்.

down to installed on every floor of the building, except

High-density ducts, in place of
big energy pipes

able Spots Worldwide

International Association of Architects and Engineers,
Chicago New York Los Angeles

bers (years)	32.2	38.0	27.4
ulation systems (years)	22.6	24.2	17.9
os insulation	46.1	34.5	27.2
fficient units	22.1	21.9	30.1



Though you'll find that you have to rekey tabular material, you'll appreciate the sophisticated support of tabs. Right, left, center, and decimal alignment make it a snap to fit all the copy in the table. However, where *Publish It!* can't find the high-resolution downloaded italic font, it substitutes its own inferior version.

SPATIAL RELATIONS

ARCHITECTURE

-BY RICHARD STANLEY



Westfield and H. toward becoming architecture firms Chicago's leading W & H D bringing Spatial going to have a f questions and sa concrete to the las

Publish It! does it all. The high-resolution .PCX file was imported without a hitch. And using the downloadable fonts in our complex arrangements of text and rules was as simple as it would have been in *Ventura*.



START

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FINISH

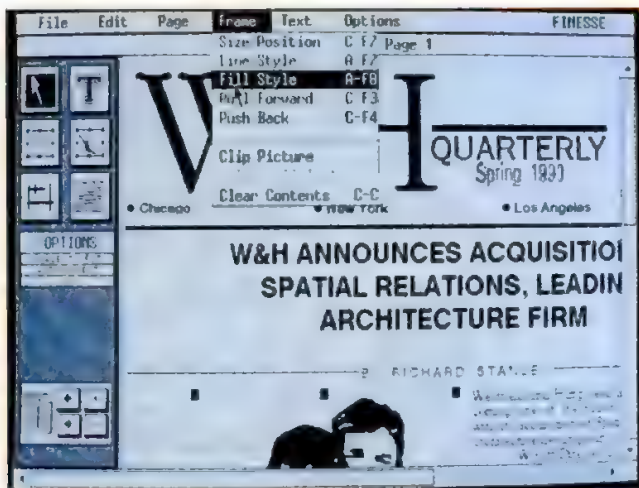
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When you draw or select a graphics frame, *Finesse* guides you logically to the next step and either displays the importing options or prompts you to resize the image. The Frames menu lets you choose line and fill patterns or fine-tune the size and position of text and graphics frames.

First Word Plus, GEM Write, WordPerfect, Microsoft Word, and ASCII.

Page layout is definitely *Finesse's* forte. Master pages encourage the use of uniform styles within a document. You can quickly format a three-column newsletter and then tweak the columns on a page-by-page basis. Master pages also contain page-numbering and date-stamping templates.

You can work on your WYSIWYG document in either actual size or full-page mode, but *Finesse* also provides an at-a-glance view of layouts. Ctrl-T toggles to an exceptionally clean view of your document that displays the filename and the sequence of chains for each story. "PROPOSAL.TXT, C1 of 5", for example, lets you know the origins of your copy and indicates that this is the first in a series of five chained frames. Similarly, graphics can be displayed as frames containing only their filenames, giving you the global picture in

to get lost in the program. For example, when you draw a graphics frame, the option box lists the four possible file formats

you may want to import: .IMG, .PCX, TIFF, and .GEM. Draw a text frame and the import options change to *WordStar*,

Springboard Publisher



Starting at 11 a.m. A garden luncheon will celebrate both the opening of the show and the beginning of spring. Contact: Kevin Hannigan.

July 12th: Los Angeles--The Museum of

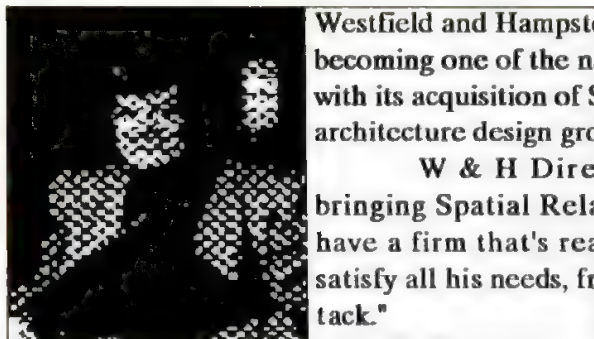
Art will be the setting for a spectacular audiovisual presentation, where viewers will be transported from the scale models in the museum to the actual buildings on location. A

contact follows. Contact: Maureen Hayes.

September 6th: London--A private afternoon viewing at the Tate Gallery and high tea will introduce the British audience

The six columns of text that constitute the itinerary in this story were easily accommodated by a single text frame in *Springboard Publisher*. Text frames can have up to nine formatted columns. Note the quality of the screen fonts, which we were forced to use in order to print out the document accurately.

This is the best it gets in *Springboard Publisher*: 72-dpi .PCX images and substituting high-resolution Bitstream fonts at print time. Notice that even though the letter forms are smooth, the letter spacing is too wide. *Springboard* does offer kerning functions, but because *Springboard* doesn't accurately display soft fonts on screen, there is no way to correct this problem before you print the document.



101 uses for your old dot matrix printer.

No. 24



Now that there's finally an affordable alternative to the dot matrix printer, it's not surprising people are finding new things to do with their old printers.

Not because their old printers don't work. But because they just don't work as well as Canon's new BJ-130e Bubble-Jet Printer.

With its reliable 48-nozzle print head, the BJ-130e provides resolution of 360 dpi in letter quality mode and speeds up to 240 cps in draft mode for crisp, clearly defined characters that won't smudge when handling documents.

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with a chain saw on your desk, the BJ-130e hums along at a mere 45 decibels.

A wide, 136-character carriage lets you print on almost any kind of paper. It even prints envelopes.

Because the BJ-130e emulates the IBM Proprinter XL 24E.™ there are many software applications to choose from.

So stop by your Canon dealer for a demonstration today. Or call 1-800-441-4848.

After all, you don't have to wait for your old dot matrix to wear out.

You may be able to find a perfectly good use for it right now.

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a flash and eliminating excessive screen redraws.

Deficiencies turn up, however, when you have need of more-exact page layout tools. The main ruler line does not display tabs or the cursor position, and it is limited to a few preset scales. A downright dearth of drawing implements restricts you to vertical or horizontal rules.

Support for tabs is pitiful, with options



Finesse

Logitech Inc., 6505
Kaiser Dr., Fremont, CA
94555, (800) 231-7717,
(800) 552-8885 (Calif
only)

List Price: \$179.

Requires: 640K RAM;

1MB free disk space;

GEM environment; DOS 2.1 or later (3.1 or later
for Bitstream Fontware); CGA, EGA, VGA,
MCGA, or Hercules graphics adapter; mouse.

In Short: *Finesse* is an elegant tool for creating
design-intensive documents. The hint-laden
interface makes it almost impossible to lose your
way. Yet the tabs, the grids, the rulers, and
especially the graphics import capabilities could
stand improvement.

CIRCLE 409 ON READER SERVICE CARD



providing only for left and decimal alignment. You assign tabs in a noninteractive, nongraphical, full-page dialog box. Even *MacWrite* 1.0 outdid *Finesse* on this score.

ERROR-PRONE GRAPHICS

Finesse's implementation of graphics import and manipulation is also disappointing, though part of the problem rests with the *GEM* environment's insistence on accepting only its own .IMG or .GEM formats. Not only do you waste valuable disk space by storing both TIFF and .IMG file formats, but *Finesse*'s own import filters cannot translate any images containing gray-scale or color information. As a result, most of our scanned TIFF images were rendered unusable, and .PCX pictures turned to mud.

Even when you have successfully converted to the .IMG format, you'll find that all three different ways of bringing images into your document are inexact and require constant trial and error. Scaling the image to the frame usually distorts the aspect ratio. Maintaining the aspect ratio usually leaves too much white space around the image. And retaining a 1:1 relationship with the original image requires that you use crude and confusing tools to clip the artwork.

You might have better luck with the screen capture utility supplied with *Finesse*, or with *SCAN*—a utility that allows you to control Logitech's ScanMan without leaving the program. The ease with which you can scan, size, and rotate artwork makes the \$300 outlay for a ScanMan enticing. In fact, using the scan utility is the only way to compensate for *Finesse*'s lack of text or image rotation capabilities.

QUICK RESPONSE TIME

Despite *GEM*'s clunky on-screen dialog boxes—and its annoying insensitivity to

Despite some shortcomings,

Finesse provides

excellent control over type

and some very flexible

layout tools. For

anyone who's been

suffocated by the

limitations of low-cost

DTP, it is a breath of

fresh air.

all but the most perfectly centered mouse clicks—it provides *Finesse* with a memory-efficient, responsive environment. And the fact that *Finesse* doesn't physically incorporate graphic images into a document, instead using pointers to indicate a picture's location, makes for fast saves and small file sizes.

Printing is slow, but thanks to an OUTPUT module that creates background batch printing routines, it hardly matters. Printer support is spotty (drivers for the Hewlett-Packard Deskjet and PaintJet are notably absent) thus you have to purchase additional driver paks from Digital Research.

Despite some real shortcomings, this program provides excellent control over high-resolution type and some very flexible layout tools. For anyone who's been suffocated by the limitations of low-cost DTP, *Finesse* must seem like a breath of fresh air.

GEM Desktop Publisher

by Edward Mendelson

What looks and works a lot like *Ventura Publisher* but costs less than half as much? The answer is Digital Research's \$299 *GEM Desktop Publisher*, a low-cost DTP package with an impressive set of advanced features and exact control over typography and design.

Don't expect *GEM* to handle the large or complicated tasks that *Ventura* was designed for. But if your desktop publishing projects are relatively modest, *GEM* delivers all the power and flexibility you'll need.

A LOT LIKE VENTURA

GEM Desktop Publisher uses familiar stylesheets to control layout and type specs. It allows fine adjustments of kerning and letter spacing at every level of a document—from individual letter pairs to a complete file. And it comes with a copy of Bitstream's *Fontware* to generate high-quality LaserJet fonts.

As in *Ventura*, *GEM*'s basic design element is an imaginary rectangle that you draw with a mouse. (*GEM*'s rectangles are what other programs call frames.) You can import a text or graphics file into a rectangle and modify its size and shape at any time. Text can flow automatically from one rectangle to another, even when the frames reside on separate pages. You can type text directly into a rectangle, and you

SUITABILITY TO TASK

GEM DESKTOP PUBLISHER

	1	2	3	4
Four-page newsletter				
Three-fold brochure, heavy graphics				
Medium-length document				
Internal report or memo				

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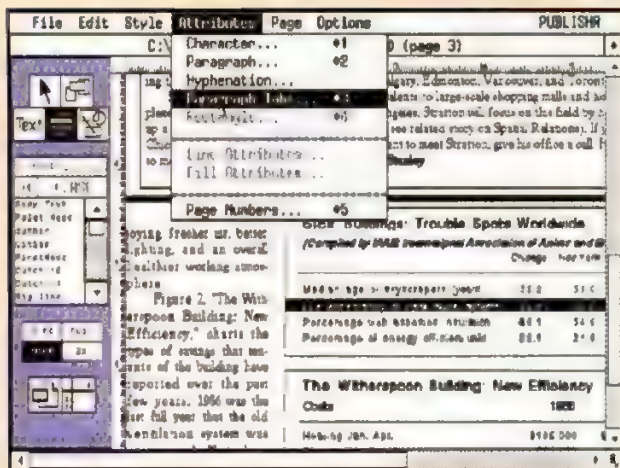
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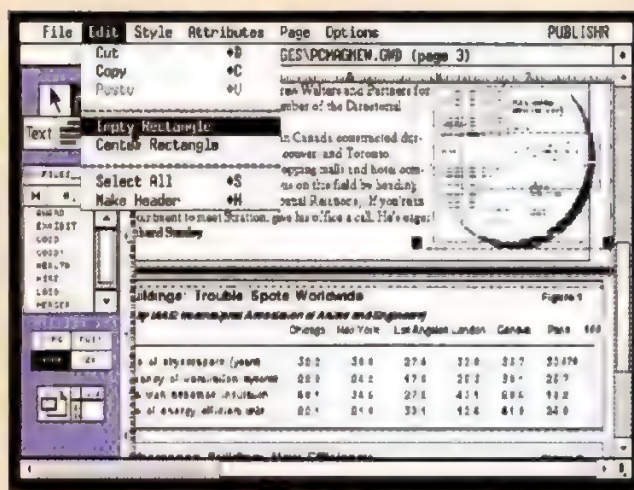
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GEM Desktop Publisher lets you create transparent or opaque rectangles. Depending on the fill you use, text and graphics are either superimposed over each other or flow around each other. Here, your choice will affect how text interacts with the pie chart on the right.



can add lines, boxes, and circles using tools built into the program.

Rectangles can be opaque or transparent. When you place an opaque rectangle over another rectangle, the text in the lower frame flows around it. When you place a transparent rectangle over an opaque one, the contents of both are visible. Although you can't automatically flow text around irregularly shaped graphics, with a little ingenuity you can create a similar effect. For example, the text that wraps around the medical symbol on page 2 of the PC Labs test document actually flows around a series of opaque rectangles that match the outline of the artwork.

Using the *GEM* graphics environment, *GEM Desktop Publisher* gives you WYSIWYG editing at markedly faster speeds than any *Windows* application, even though it exacts a price and limits flexibility and conveniences. Though the program supports color ink jet printers,

PostScript, and Hewlett-Packard laser printers, you can't print directly from the program: you have to save your file first and then open a separate *GEM* application to print.

Compared to more-recent *GEM* applications like *Finesse*, *GEM Desktop Publisher* doesn't look elegant on-screen, and it achieves even its most impressive results with technology that seems relatively primitive. For example, as you look through the many miscellaneous instruction sheets that accompany the six different manuals (for *GEM Desktop Publisher* and the complete *GEM Desktop* environment), you come across a warning that you can't print on a LaserJet unless you first generate soft fonts with Bitstream's *Fontware*. You are then instructed to install the fonts using a separate Font Merge utility. I spent two hours with three separate manuals trying unsuccessfully to install the fonts before I gave up and called

GEM Desktop Publisher lets you create complex paragraph formats. The tables at the lower right take advantage of the program's four different kinds of tab alignment: decimal, centered, left, and right.

Digital Research. The technician explained that if I followed the Font Merge manual, it would be impossible to install the fonts because the manual describes an older version of the program. She then walked me through the installation procedure, which she correctly described as un-intuitive.

Though you can import text files from a variety of applications, including *WordPerfect 4.2* (not 5.0), *Microsoft Word*, *MultiMate*, *WordStar*, and *DisplayWrite*, graphics files must be converted to .GEM or .IMG formats. Some of the import filters choke on complex files. In addition, Digital Research's auxiliary conversion program that translates .PIC or .PCX files to .IMG works only with small and simple images.

PERFORMANCE WOES

When you first design a *GEM* document, the program generates a profusion of files, including a sheaf of temporary files that it creates every time you open an existing document. Type text into an empty rectangle and the program insists on making a separate file for it. If your design includes a lot of captions and headings, you may end up with dozens of files that are part of a single document. All of this makes the process of saving your file so slow that you may not save often—a dangerous economy, because a crash or program error can cause you to lose hours of work. It happened to me.

I encountered serious errors when I tried to recreate *PC Magazine's* exceptionally complicated sample newsletter. Although the program almost succeeded in recreating the file, some problems proved

GEM Desktop Publisher, Version 2.01
Digital Research Inc.,
Box DRI, Monterey, CA
93942; (800) 443-4200,
(408) 649-3896
List Price: \$299
Requires: 640K RAM;
hard disk with 2MB free, or two floppy disk drives;
GEM environment; DOS 2.1 or later, CGA, EGA,
VGA, MCGA, or Hercules graphics adapter.
Mouse recommended
In Short: *GEM Desktop Publisher* has layout
and typographic tools for creating complex and
precise formats, but in PC Labs' benchmark
testing, serious bugs started to appear as the test
document became larger and more complicated.

CIRCLE 410 ON READER SERVICE CARD

**WHAT'S
ONE
WITHOUT
THE OTHER?**

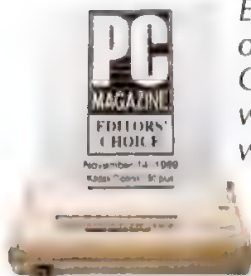
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unsolvable. Text justification often worked erratically. Most often the first line of a paragraph was indented at the right and the left, but sometimes a random line in the middle of the paragraph was short by several characters as well.

At least five times (always under differ-

ent circumstances), a message announced that an internal error had occurred and that my data might be corrupted. The first time this happened, I made the mistake of clicking on "OK" and exiting normally—only

to find that the whole document had been purged beyond recognition. The next time it happened, I rebooted and lost only the work I had done since the last time I had saved the document.

As the test newsletter grew more complex, GEM sometimes displayed normally

THE GREAT DEBATE: PCL Versus PostScript

by Alfred Poor

When the time comes to print the documents they've labored over, even low-end DTP users want access to fast, high-quality output devices. And that means laser printers, because even the best dot-matrix machines still fall short of a laser's near-typeset 300-dot-per-inch output.

Unfortunately, many low-end DTP users look at laser printers longingly, in the meantime postponing a purchase because of a perceived price barrier and confusion over the relative virtues of Adobe's PostScript versus Hewlett-Packard's Printer Control Language (PCL).

Cost is less of an issue than ever before. New developments on the price front are putting laser printers on the street for about \$1,000. The latest low-cost models from HP or Canon, for example, run at half the speed of top-of-the-line lasers, but delivering four pages per minute instead of eight won't affect the quality of the printout.

Most 300-dpi engines have similar physical capabilities when it comes to placing toner on a page. The real difference between printers like the Hewlett-Packard LaserJet Series II or the Apple LaserWriter IINTX (and their respective compatibles) rests with the printer's command set. HP's PCL and Adobe's PostScript tell the engine which font to use or how to create the graphic image.

Whether because of Adobe's hefty licensing fee or the high costs associated with developing a bullet-proof clone, PostScript capability adds considerably to the price of the printer you buy. However, PostScript printers deliver up to 35 scalable typefaces, include several megabytes of memory, and have the intelligence to interpret PostScript vector graphics.

Scalable typefaces are advantageous because they can be resized without de-

grading the quality of the outline: edges are always smooth, lines are always clean. PostScript also lets you create special effects with text, such as printing words in a circle.

Cloning PCL, however, is a less formidable task. The resultant lower prices of HP compatibles, as well as

Hewlett-Packard's printer control language lacks the versatility of PostScript.

But given the right software and PCL laser printers priced below

\$1,000, it may not matter.

Hewlett-Packard's considerable market share, have made PCL printers a ubiquitous presence in corporate offices.

Printers that use PCL drivers require a copy of each bitmapped font (which consists of a typeface specified to size and style—such as 16-point Times italic) to be present in the printer's memory. High-resolution fonts may be included in the printer's ROM (internal fonts), may reside on a ROM cartridge, or may be downloaded from your computer's hard disk (soft fonts).

Because of their reliance on bitmapped fonts, PCL printers do not offer all the benefits of PostScript machines. Bitmapped fonts cannot be resized from within application programs; moreover, they require more disk space than vector equivalents.

The typographic limitations of a PCL printer may not be a major problem for low-end DTP applications. For example, restrictions on large point sizes can be easily overcome by creating headlines and logos in a paint or

drawing program, then importing the image into your DTP document as art. After all, the average business document doesn't often require more than one or two words in 72-point type. And it may be difficult to discern the difference between headlines from a 300-dpi TIFF file and headlines generated with outline fonts.

In fact, bitmapped fonts can actually make a PCL printer faster than a PostScript for many text-intensive applications because the PCL printer doesn't have to interpret or scale type outlines while generating paper output.

Too often, HP-compatible printers are blamed for the shortcomings of low-end DTP programs. Some low-end DTP packages, for example, won't recognize cartridge fonts or downloadable fonts from third-party vendors such as Bitstream. Even more seriously, there are programs that ignore a printer's internal fonts, and instead send formatted pages to the printer as bitmapped images. Text is treated as though it were simply a part of a full-page illustration. The printer seems slow because in place of merely identifying the letters to print, the program sends the page to the printer one dot at a time.

At 300 dpi, this sort of full-page bit-map will generate an error message on PCL printers with only 512K of memory, such as the HP LaserJet Series II. Solving the problem by lowering the resolution from 300 to 150 dpi to fit the entire page into memory results in a comparable loss of quality.

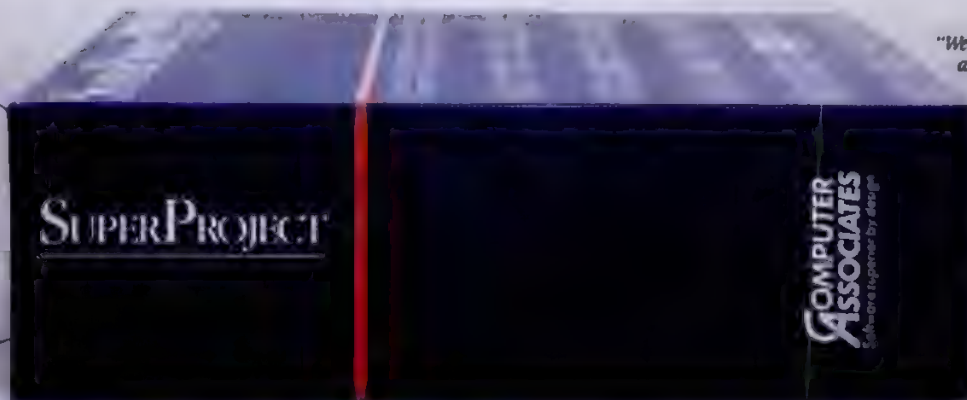
Ultimately it is the software's responsibility to take advantage of the power—in the form of cursor-positioning instructions, graphics primitives, and shading commands—that PCL offers. As long as your DTP program supports PCL intelligently, the new low-cost HP-compatible laser printers are the perfect output devices for corporate publishing projects. ■

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invisible paragraph-style tags as part of the text on the screen. And when I attempted to flow a story around too many opaque rectangles, the program began to reformat the text endlessly; the screen looked like a window shade flapping after being rolled too tight. The only way to exit the loop was to reboot. Digital Research's technical support staff had not encountered either of these bugs before.

If you normally work in the *GEM* environment, you may find the one desktop publishing package written by the creators of *GEM* itself worth your consideration. *GEM Desktop Publisher* can get the job done—as long as the job isn't very complicated and doesn't stretch the program beyond its powers.

PageBuilder

by Bill O'Brien

When you draw the distinction between desktop publishing and page composition, you'll find that CSI Publishing's *PageBuilder* has one foot on either side of the line. Though this \$295 package met all of the selection criteria for this story, the program's graphical user interface merely aspires to WYSIWYG status, and type specifications are more easily created in the program's co-resident text editor.

PageBuilder does contain a menu-driven graphical user interface, but it doesn't give you a readable screen representation of the text in your document. Even if you take advantage of the program's 200 per-

Looking at the poor quality of this WYSIWYG text display, it's difficult to believe that *PageBuilder* can reproduce its bitmapped fonts so well and so quickly on the HP LaserJet. Even at 200 percent magnification, the screen text is nearly unreadable, but the printed fonts are crisp and clear.

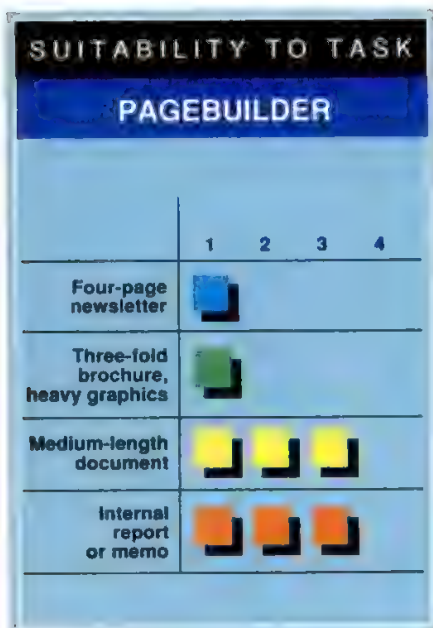
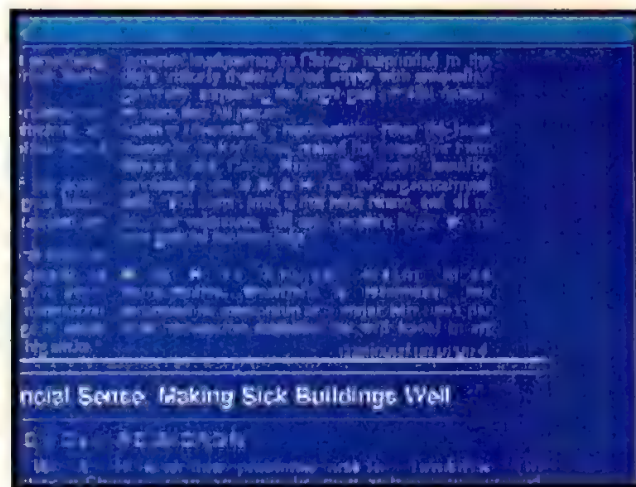
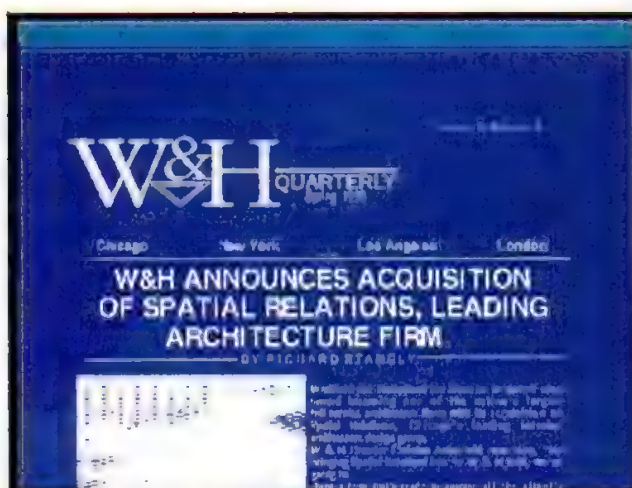
cent zoom, the text appears to be a remnant of a 1,000-year-old wall carving. WYSIWYG editing, though available, is nearly unusable. When you insert the text cursor, for example, everything to the right of your click disappears until you've finished typing.

INTERNAL TEXT EDITOR

Better by far than *PageBuilder*'s WYSIWYG editing facilities is its ancillary full-screen text editor. You can create text here, but writing is really best done off-line in your favorite word processor, provided it will export the only kind of text files *PageBuilder* can import: ASCII.

The editor, however, has a more important function as a text formatter. In terms of both speed and reliability, using the editor as a page composer to imbed font names and formatting instructions directly into the text is easier than highlighting copy blocks and selecting fonts from one

Although *PageBuilder* could not interpret complex .PCX images, it handled simple .PCX files, like the newsletter logo, quite well. Scaling is available only along the diagonal axis; all other modifications (such as cropping) must be made in the original program that generated the .PCX file.



of *PageBuilder*'s pull-down menus. This is especially true of documents like our test newsletter, which uses multiple typefaces, point sizes, and type styles within a single text passage.

As its name implies, *PageBuilder* constructs a document from a collection of text and graphics objects that reside outside the program. Instead of creating a single document that contains imported objects, the program maintains a list of objects and their attributes, such as size and position. Assembling a page requires a fair amount of orchestration, but running on an IBM PC AT, *PageBuilder* is actually no slower than *PageMaker* on this score. However, both picture and story files are vulnerable: any editing done within a *PageBuilder* document becomes a permanent change in the original file.

Of all the objects that *PageBuilder* handles, text is perhaps the most difficult to control in that it contains two levels of

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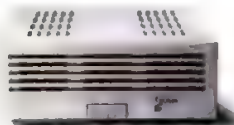
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CIRCLE 373 ON READER SERVICE CARD

primitives: words and individual letters. *PageBuilder* deals with text in two distinct ways depending on whether it is headline or body copy. Headlines are limited to single lines that may be placed either horizontally or vertically on a page. In addition, the size of display type is limited to the high-resolution bitmapped fonts bundled with the program. Though additional font libraries are available from CSI Publish-



**PageBuilder,
Version 2.0**

CSI Publishing, 13721A
Rosewell Ave., Chino
Hills, CA 91710; (916)
756-4158

List Price: \$295.

Requires: 640K RAM,
4.5MB free disk space;
DOS 3.0 or later; CGA, EGA, VGA, MCGA, or
Hercules graphics adapter; mouse.

In Short: *PageBuilder* is an excellent page-
composition tool for manipulating a limited
number of text and graphics objects. More suited
to applications requiring text formatting, it lacks
some of the more-refined design features we've
come to expect from DTP software.

CIRCLE 419 ON READER SERVICE CARD

ing, *PageBuilder* does not support scalable third-party fonts.

Body text, on the other hand, flows within any area that you care to define. The designated text area can consist of one or multiple columns of any width or depth. The text areas need not even be on the same page because the *PageBuilder* program can flow text across a maximum of 50 pages.

PageBuilder facilitates the electronic design process with powerful exclusion boxes that allow you to reserve space in the layout for graphic images. When an exclusion box overlays a text area, it forces the copy to auto-wrap around the boundaries. A complementary function allows you to customize the look of your page by choosing to flow text either around or within irregular shapes.

Though White Sciences, the author of *PageBuilder*, claims that TIFF files will be supported in the next release, at the moment you can import only .PCX files. *PageBuilder* interpreted the PC Labs test logos without incident; however, the more complex scanned images were literally trashed.

In order to size a picture you must define it as a symbol, which—in addition to a standard set of drawing shapes—is one of *PageBuilder*'s graphics primitives. Even

so, scaling is allowed only along the diagonal axis, and no cropping function is available.

VERTICAL LEARNING CURVE

Because of its complex, everything-is-a-separate-object nature, *PageBuilder* does have a steep learning curve. For example, it uses a hierarchical system to store the various parts of a document. Each page of a document is maintained as a separate unit. Switch to page 2 without first saving page 1, and everything you've done is lost. It takes time and practice to become habituated to the arbitrary procedure that requires you to save each page individually and then store the overall laundry list of files that constitutes a document.

PageBuilder's rudimentary leading and kerning abilities bring its deficiencies as an interactive DTP program into focus. Changing the leading requires you to indicate a percentage of the standard line-spacing distance for the font size selected (although no reference to the actual size of the standard is supplied). And kerning is actually microspace management that relies on you to establish a ratio between character spacing and word spacing.

Balanced against these deficits are some real assets, such as the ability to control a scanner, create simple charts and worksheets, save designs as templates, and produce a slide show. *PageBuilder* is worth investigating, but only if you need page composition without the amenities we've come to expect from DTP.

PFS:First Publisher

by Robin Raskin

PFS:First Publisher, from Software Publishing Corp., boasts the largest installed base of low-end DTP users. It won the lion's share of the market because it is blissfully simple to use and, at \$129, a bargain as well. A least-common-denominator sort of program, *First Publisher* will run efficiently even on an 8086 with only 512K RAM, two floppy disk drives and no mouse. There is no installation procedure other than copying the working files to the proper subdirectory and running a separate utility to choose a printer.

It hardly matters that the on-screen help is not context sensitive because the straightforward menus are self-explana-

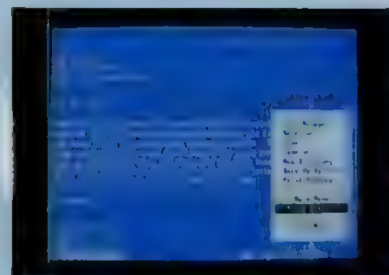
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- **PC Paint Plus**, the powerful, easy to use paint and illustration program.



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CIRCLE 293 ON READER SERVICE CARD

tory. The toolbox, which contains a reasonable collection of rules and boxes as well as freehand drawing capabilities, completes the totally monochrome screen.

Though *First Publisher* has been on the top of the entry-level DTP heap for a

SUITABILITY TO TASK				
PFS:FIRST PUBLISHER				
	1	2	3	4
Four-page newsletter				
Three-fold brochure, heavy graphics				
Medium-length document				
Internal report or memo				

while, its prospects for staying there look dismal. Although all the elements of your document are displayed on-screen simultaneously, the program defies the concept of integrated composition by keeping the text and graphics on segregated overlays. In graphics mode, for example, the on-screen text is grayed-out and untouchable.

The best way to ensure that such elements as picture captions and "continued" lines remain in position is to enter the text while in graphics mode. You're trading legibility for sanity: the continued line won't be inadvertently moved to the middle of the column, but you are sacrificing 150-dots-per-inch type for the poorer graphics resolution of only 72 dpi. Mixing graphics text and normal text results in uneven quality within a document.

WORKING IN TEXT MODE

You create and modify page layouts in *First Publisher* by using text baselines—which have the familiar look of grade-school notebook paper. You can shorten or lengthen baselines, move them up or down on a page, and change the spacing between them. This can be done on an individual basis or by manipulating all baselines above and below a certain location. Even the simplest layout requires that you manipulate baselines. For exam-

ple, this is the only way to adjust line lengths for paragraph indents because there are no tab settings in the program.

Despite eye strain from reading grayed-out text, working with these baselines is conceptually simple. Wrapping text around an irregular graphic requires only that you drag baselines closer to the edge of the shape, and you just zero-out a baseline to open up white space on the page.

Exasperation sets in when the document design doesn't match the prescribed, inflexible manner in which text flows among the four allowable columns. You can create a few variations by zeroing out certain baselines for portions of a page, but no techniques or tricks will allow you to change the linear flow of text, from baseline to baseline, from column one through column four. Unless you are willing to hand-paste individual lines of copy, a document such as our test document is impossible to create, much less revise.

First Publisher relies on an external utility, *Fontmove*, to manage which fonts will be accessible to your document. Up to 14 fonts can be installed in the master font list simultaneously. Support of dot matrix fonts is exemplary. Though limited to only 150 dpi, these typefaces are plentiful and come in various point sizes, with optional attributes such as boldfacing and italics. But if you are printing out to an HP LaserJet, you'll find that out of the four *HP Soft Fonts* supplied, only Courier and Lineprinter are true 300-dpi fonts; Helvetica and Times Roman print at 150 dpi unless you install one of HP's cartridges.



FACT FILE

PFS:First Publisher
Software Publishing Corp., 1901 Landings Dr., P.O. Box 7210, Mountain View, CA 94039; (415) 962-8910. List Price: \$129.

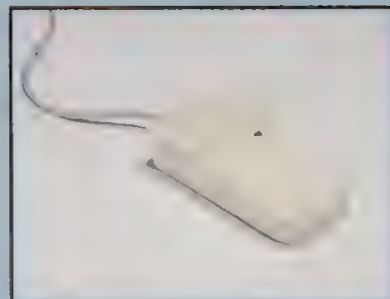
Requires: 512K RAM; hard disk with 2MB free, or two floppy disk drives; DOS 2.0 or later; CGA, EGA, VGA, or Hercules graphics adapter. Mouse recommended.

In Short: *PFS:First Publisher* once ruled the low-end DTP roost, but this program pits the user's ingenuity against the program's limitations—which include a maximum of four columns per page, 72-dpi graphics, insufficient support for 300-dpi fonts, and rigid control of text flow.

CIRCLE 411 ON READER SERVICE CARD



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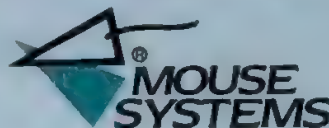
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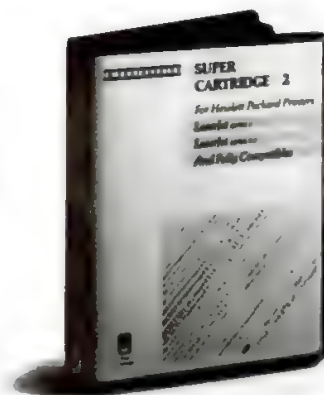
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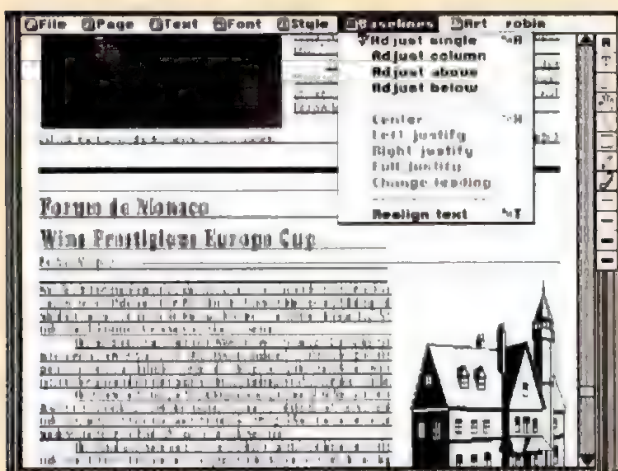
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CIRCLE 325 ON READER SERVICE CARD

Our original scanned .PCX file contained two women side by side. But when a high-resolution image is imported into PFS:First Publisher's 72-dpi limit (at nearly a 2:1 pixel ratio), the image must be cropped.

Note that First Publisher has a decent set of image manipulation tools.



PFS:First Publisher works in two distinct modes: text and graphics. In graphics mode or when you are manipulating baselines, all text appears grayed out. Here, the clip art and the baselines are clearly visible, but working with text is an adventure in eyestrain.

A coupon included with the program entitles you to the full Bitstream Font Installation Kit (and the scaleable Charter Medium typeface) for only \$15. Without it, Bitstream support within PFS:First Publisher is limited to a free sample diskette that contains five already scaled Bitstream fonts—which are of minimal use since you can't create your own point sizes.

THE 72-DPI BLUES

First Publisher can handle 72-dpi graphics. It successfully imported several of the high-resolution bitmaps in the PC Magazine sample newsletter, but it could interpret the files only as low-resolution .PCX pictures and so displayed them as oversized, grainy images. If your documents require only clip art, you may find what you need within the plethora of clip-art images offered by SPC: 150 come with the package; add-on libraries are available.

All art—whether imported via First

Publisher's support for .PCX images, selected from its own .MAC clip art (which is a headerless Macintosh file format), or created with the supplied SNAPSHOT screen-capture utility—must be converted and saved as First Publisher .ART files.

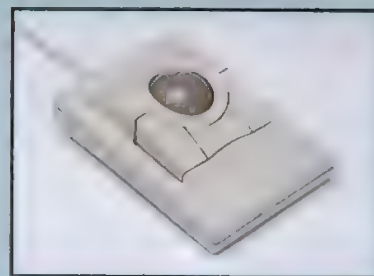
Yet another example of how First Publisher encourages you to be a master planner: You had better prepare images before you start a document. If you don't, you'll find that creating an .ART file requires saving, exiting, and then returning to your document in progress.

Because everything in First Publisher is bitmapped, the only way to select a graphic element for modification is to use the selection tool and box the area; miss a corner of an image and it remains behind. More often than not, you'll need the Magnify tool to hand-edit pixels and clean up the results. Other welcome features let you rotate, flip, and invert images.

Word processing features are poor.

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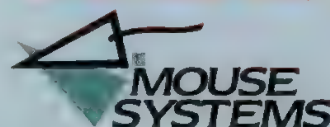
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CIRCLE 120 ON READER SERVICE CARD

DESKTOP PUBLISHING LOW-END PROGRAMS

There are no tabs, a limited ruler that doesn't display the cursor position, no search-and-replace, and no paragraph indents. There's no automatic page numbering, nor is there landscape mode. The Show Page command displays a small, squashed, greeked version of the full page. The program does import text from a variety of word processors, and it can accommodate a 99-page document.

A DeskMate version of *First Publisher*

provides an attractive graphical interface but also hogs memory. On a 640K machine (where the only other RAM-resident program in use was a mouse), I had to boot the program without my usual extended memory simply to free enough RAM.

It stands to reason that SPC will defend *First Publisher's* market share with a new version of the program—rumored to be

available by the second quarter of 1990. Rumor has it that remedies to present-day shortcomings will include high-resolution fonts (Bitstream Speedo technology has already been announced), TIFF images, color screens, and more-sophisticated layout capabilities. But low-end DTP is a moving target. Though the current version of *First Publisher* was once a well-positioned entry-level package, it can no longer keep up with other packages in its price range.

WORD PROCESSING AND DESKTOP PUBLISHING CONVERGE IN AMI

by Luisa Simone

The integration of pictures and words has always been the province of desktop publishing; good old-fashioned word processors have always been characterized as export-only applications. The words created in character-based text editors are either sent out to printers or exported to more integration-oriented programs like *PageMaker*, *Ventura Publisher*, or even *PFS:First Publisher*.

But word processors are now proving that they too can function as inclusive applications, incorporating graphical data from drawing, painting, or charting programs and numerical information from spreadsheets or databases. *WordPerfect 5.1*, for example, boasts live links to *Lotus 1-2-3* worksheets. The extension .WPG, denoting the WordPerfect Graphics format, is popping up in programs as diverse as *HiJaak* from Inset Systems and *ColorIX-VGA Paint* from RIX SoftWorks. *Microsoft Word 4.0's* table generator lets you create complex layouts by joining, stretching, and otherwise manipulating cells; in addition to text and numbers, those cells can contain graphic images.

Amazing as all of these programs may be, the real threat to low-end DTP programs comes from the new breed of WYSIWYG word processors such as *Ami*, *Ami Professional*, and *Word for Windows*. These programs take advantage of the *Microsoft Windows* graphical environment to combine high performance with ease-of-use.

AMI FITS THE FILTER

Ami, a \$199 package from Samna Corporation, surprisingly meets all of the selection criteria applied to the desktop

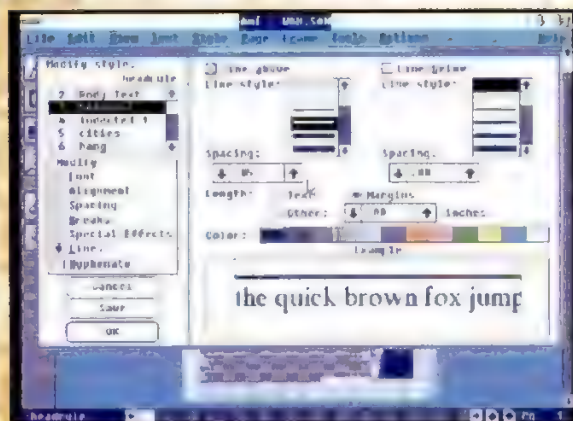
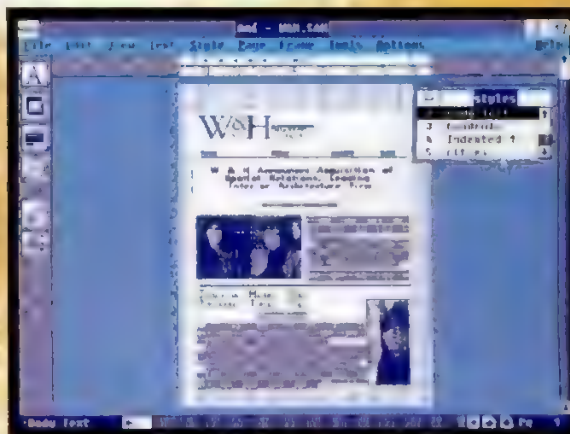
publishing programs we review in this story. Like most low-end DTP programs, *Ami* lets you type in a story directly or import it. It accepts ASCII, *Samna Word*, *WordPerfect 5.0*, and *WordStar 2000* files. The text that constitutes the main body of a document can automatically wrap around frames, and frames can contain text or pictures.

As with *Springboard Publisher* (the only *Windows*-based low-end desktop

publishing package), only one story—residing on the base layer of a document—can flow from page to page. While this restriction is acceptable for a word processor, it does limit *Ami's* design capabilities.

Getting the main story to flow from page to page is not very hard: insert enough frames and the copy flows automatically, or use hard page breaks to force text onto the next page. But jump-

Though the headlines are legible in this full-page view, body copy is greeked. The various icons at the left of the screen (starting at the top) let you switch between draft and layout modes, create frames, modify paragraph styles, change to a different view of the page, undo mistakes, and send a file to the printer.



This dialog box allows you to modify *Ami's* type styles. The hardest part of creating and managing so many different styles may be keeping track of what the names mean. You choose the item you wish to modify at the left (here, *line style* is highlighted), and the appropriate options, such as line width, position, and color, become available at the right. Note the preview box at the lower right of the screen.

Publish It!

by Robert Kendall

Anyone who thinks that power and sophistication are exclusively the domain of high-priced products should take a look at *Publish It!*. This remarkable \$199 package from Timeworks lets budget-conscious users venture down the road of serious desk-

top publishing without banging their shins on program limitations at every step.

In look and feel, *Publish It!* resembles *Ventura Publisher*, partly because both programs run under Digital Research's *Graphical Environment Manager (GEM)*. Its four modes of operation—frame manipulation, text editing, paragraph tagging, and drawing—work much the same

as *Ventura's* and are selected in the same way, by clicking on toolbox icons. The five zoom levels, which are always available through a menu or speed keys, display even the tiniest text clearly.

Publish It! doesn't balk at filling a document with a prodigious number of layered text and graphics frames. Clicking once on an element lets you quickly reposition or resize the frame. Double clicking brings up a dialog box where you can enter

ing copy to a noncontiguous page is far more difficult. Furthermore, cutting and pasting text between frames is tedious work, making revisions a formidable task.

But *Ami* outperforms *Springboard Publisher* in many ways. *Ami* utilizes *Windows* drivers to give users access to an impressive array of high-resolution printers. It displays *Windows* screen equivalents for downloaded soft fonts. Though the screen positions of letter pairs and line spacing don't always match the printout, installing and working with the soft fonts are as painless as possible.

Even more impressive is *Ami's* support of high-resolution TIFF and .PCX files. The program worked with 300-dot-per-inch black-and-white images, and though gray scales are still beyond the ken of most low-end DTP programs, it remarkably imported even 8-bit-deep gray scale images. The Frames menu contains tools to resize and crop artwork. A nifty option lets you decide whether *Ami* incorporates a copy of the image into your document or merely points to the picture's external location on the hard disk. Best of all, I was able to import a *Corel Draw!* logo directly into *Ami* via the *Windows* Clipboard.

Other features include interactive tab rulers, control over paragraph breaks, and the ability to change ruler units from inches to points, picas, or centimeters.

A WORD PROCESSING HERITAGE

Despite these truly powerful features, *Ami* is still a word processor, and the difference between word processors and electronic page-layout programs becomes evident when you attempt to fine-tune a document by adjusting leading or adding rules. For example, *Ami* limits control over leading by asking you to choose between typewriter-style

single or double line spacing. Even the Custom leading option forces you to increase the space between text lines in predetermined increments, which can result in awkward-looking paragraphs.

Ami doesn't draw rules because the program doesn't contain drawing

tools. Instead, rules exist as a formatting feature of pages, frames, or paragraphs. These constraints are hardly noticeable when a design isn't too demanding. For example, I was able to duplicate the heavy rule between the two stories on the first page of our test newsletter. I simply created a paragraph style for the "Forum De Monaco" headline that included both the type specs and a 4-point rule, which was placed a quarter of an inch above the paragraph. However, I could find no efficient way to deal with the rules that surround the authors' names in our newsletter, because rules can only be formatted above or below text, not beside it.

Users attempting to publish formidable documents may ultimately

**Graphical word processors
like *Ami* from
Samna Corp. can easily
replace low-end DTP
programs when the job at
hand requires modest
publishing prowess.**

choose more-advanced word processors like *Word for Windows* or *Ami Professional* over low-end DTP programs.

These programs employ DDE (Dynamic Data Exchange) links to other *Windows* applications, such as *Excel*; they also offer sophisticated graphics capabilities like gray-scale editing and built-in charting functions.

For basic documents, however, *Ami* provides the best of both worlds at a very low price. A full-fledged spell checker, search-and-replace functions, and a speedy draft mode confirm *Ami's* role as a word processor.

And yet, with four different WYSIWYG editing modes plus dialog boxes that provide instant feedback on your formatting choices (with previews of typefaces, point sizes, line spacing, and rules), *Ami* is truly graphical in its operation. ■



Ami
Samna Corp., 5600
Glenridge Dr.,
Atlanta, GA 30342;
(404) 851-0007.
List Price: \$199
(includes a runtime
version of
Windows).

Requires: 640K RAM; 80286- or 80386-based computer with hard disk; DOS 3.0 or later; CGA, EGA, VGA, or Hercules graphics adapter.

In Short: With some creative design decisions, *Ami* proved capable of producing our complex newsletter. This WYSIWYG text editor makes intelligent use of the *Microsoft Windows* environment; as a result, access to high-quality typefaces and high resolution graphics is truly effortless.

CIRCLE 412 ON READER SERVICE CARD



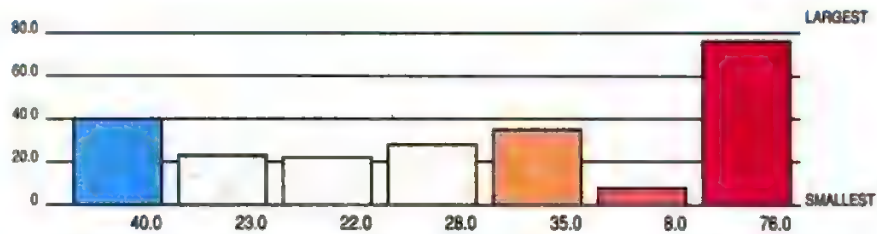
PERFORMANCE TESTS: LOW-COST DESKTOP PUBLISHING

While the *PC Magazine* timed tests can give you an idea of how a product's features influence performance speed, don't be misled. With a 21-minute print time, our Editor's Choice, *Publish It!* from Timeworks, may seem a slow performer. Yet its stable performance and the superior quality of its output are simply worth waiting for.

File Size (Text Only)

(kilobytes)

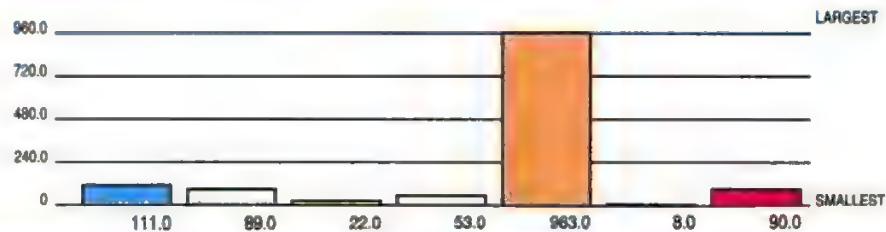
For the **File Size (Text Only)** test, the size of the file containing our sample newsletter's text is measured after it has been stored in each program. The file's size may increase depending on whether the program points to the external location of text files, stores the files internally, or converts them to a native file format.



File Size (Text and Graphics)

(kilobytes)

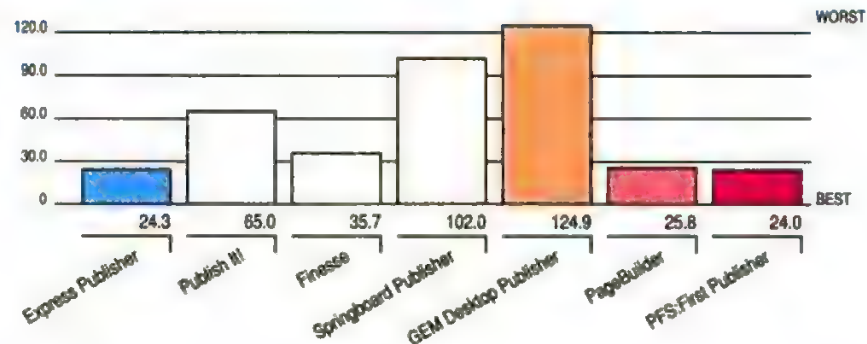
The **File Size (Text and Graphics)** is derived by adding together all files created specifically for the test document. Stylesheets that pertain only to the newsletter are included; general files that are not attached to it (such as fonts and executable files) are not included.



Open a Four-Page File

Elapsed Time (seconds)

Open a Four-Page File measures the amount of time required to load the four-page newsletter. Timing starts with the entry of the command to call up the newsletter and stops when the program finishes drawing the first page on the screen. The test is performed three times, and the results are averaged.



PC Labs tested seven low-cost desktop publishing packages using a series of timed performance tests and a four-page sample newsletter designed for the purpose. The tests were conducted on a standard 8-MHz IBM PC AT with

640K RAM, a 30MB hard disk, 1MB of expanded memory, and an EGA graphics adapter and monitor. The newsletter was printed on a Hewlett-Packard LaserJet Plus with 2MB of RAM.

All timing was done with a stopwatch. Reviewers started the clock immediately on entering the last keystroke to execute a given command, and they stopped timing when the processing ended.

CONTINUES

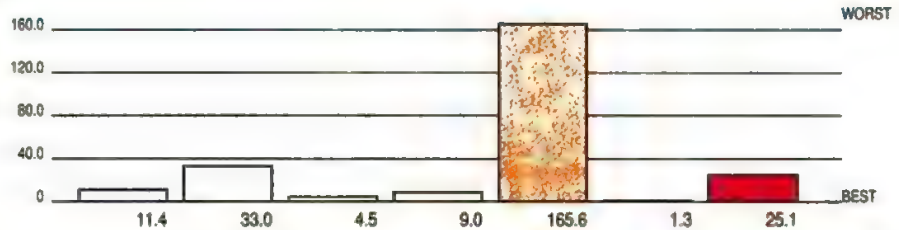


PERFORMANCE TESTS: LOW-COST DESKTOP PUBLISHING

Save a Four-Page File

Elapsed Time (seconds)

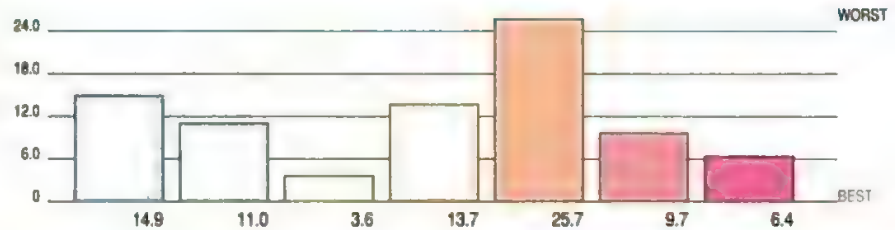
Save a Four-Page File measures the time required to save the newsletter. The first page of the newsletter is displayed on-screen before the test begins. No changes are made to the document. Timing starts with the entry of the command to save the newsletter and stops when the file is saved. The file is saved three times, and the results are averaged.



Turn Page (1 to 2)

Elapsed Time (seconds)

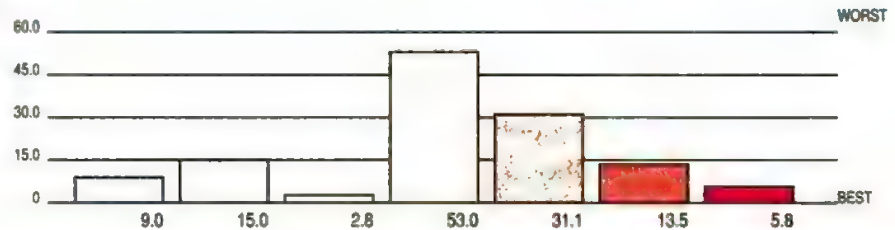
The **Turn Page (1 to 2)** test begins with the document on-screen, in a full-size view, with text and graphics displayed. Timing starts when the command to turn the page is issued and ends once the screen is completely redrawn. We perform several versions of this test; here we report the time needed to turn from page 1 to page 2. The test is performed three times, and the results are averaged.



Turn Page (1 to 4)

Elapsed Time (seconds)

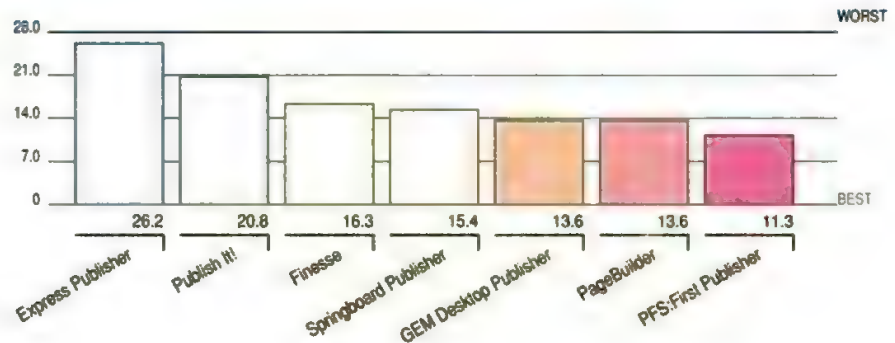
The **Turn Page (1 to 4)** test is similar to the other Turn Page test, except that the program is ordered to flip to page 4. Wherever possible, a direct Go To command is used; when necessary, the program is told to turn the page three times. The result represents the time needed to turn from the first page of the newsletter to the last one.



Print Document

Elapsed Time (minutes)

To prepare for the **Print Document** test, the printer is initialized. The test begins when the print command is entered and ends when the last page of the newsletter is ejected from the printer. The test is performed twice, and an average of the results is taken.



CONTINUES



PERFORMANCE TESTS: COMPOSITE VIEW

Although we made every attempt to produce exactly the same four-page newsletter with each of the products, the capabilities of low-cost DTP programs vary so significantly that disparities in performance times were bound to occur.

Variations in the **File Size** results are a good indication of how a program stores not only the text and graphics associated with a document, but any related stylesheets as well. *Finesse* does import text files, but instead of importing graphics it simply uses pointers to indicate the location of external image files. The payoff is a tiny file size of 22K.

PageBuilder goes even farther, storing everything that pertains to a document—both text and graphics—externally. The 8K file contains only a list of file names and locations and the necessary formatting information.

The file size also reflects a program's capability to import high-resolution graphics. Unlike *Finesse*, *GEM Desktop Publisher* imported several 300-dot-per-inch images, which increased the size of the document dramatically.

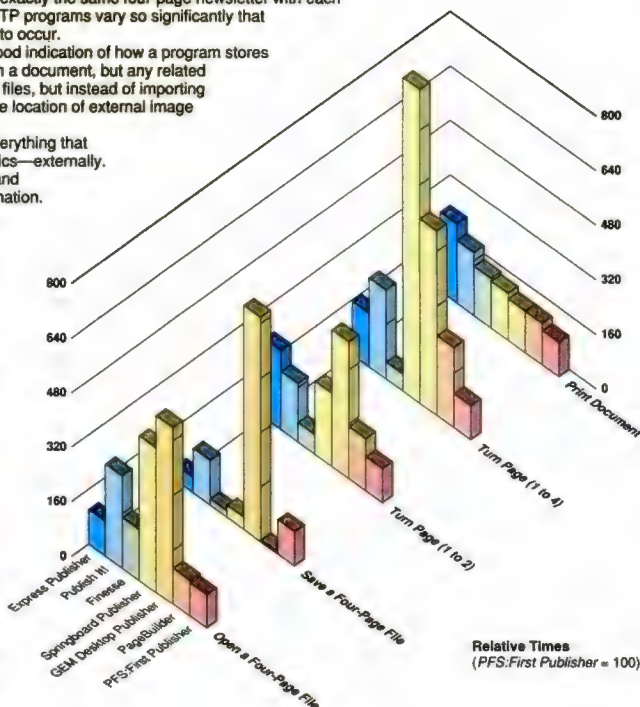
Our test newsletter contains quite a few graphic images—a good way to test a program's efficiency when loading a complex document into memory and saving it to disk. Obviously, *GEM Desktop Publisher* had quite a bit of trouble when asked to **Open a Four-Page File** and **Save a Four-Page File**, but at least it was consistent. *Springboard Publisher* generated anomalous results by taking over a minute and a half to open a file and only 9 seconds to save it. The program's awkward font substitution system requires it to read all of the font information when you first open a document. Yet, because *Springboard* saves only the portions of a file that have been changed, storing a file can be an amazingly efficient operation.

Again, what *PageBuilder* actually does in the brief 1.3 seconds reported here is to update a list of file pointers. You are forced to save each page individually before you attempt to save the entire document.

The **Turn Page** tests, which were designed to discover whether a program uses a buffering scheme to speed up screen redraws, produced the most erratic results. The times illustrate the difference between drawing a page to screen that contains a lot of graphics (page 2) and a page containing mostly text (page 4). *Springboard's* frustrating score of 53 seconds to turn from page 1 to page 4 reflects its lack of a Go To command. To get from the beginning to the end of a document you must scroll through all the intervening pages.

The **Print Document** results are influenced dramatically by the way a program handles fonts and by the resolution at which it prints graphics and type. For example, when *Express Publisher* prints a document, its convenient scalable Compugraphic fonts must be translated to 300-dpi bitmaps and downloaded to the printer, resulting in the slowest time—over 26 minutes. Although it takes less than half as long to print, *PFS:First Publisher* delivers only low-resolution graphics.

Overall, *Finesse* and *PageBuilder* were the fastest programs in this roundup. But speed alone is not enough to win *PC Magazine's* Editor's Choice designation. *Publish It!*, though not distinguished by spectacular times, provides the most consistent performance on the whole—and the most powerful features of all the programs in this roundup. While you consider the 21-minute printout time, keep in mind that *Publish It!* was the program that produced the highest-quality document with the fewest hassles.



Relative Times
(PFS:First Publisher = 100)

ENDS

DESKTOP PUBLISHING LOW-END PROGRAMS

precise frame coordinates and dimensions: measurements to the hundredth of an inch are a godsend for managing highly complex layouts like that of our test newsletter. Clicking on successive frames links them together to accommodate the text flow of longer stories.

Control over frames includes the ability to select different border styles, as well as the ability to determine how closely text will run around layered frames when you invoke the automatic wrap feature. Master pages, which can vary for left- and right-hand layouts, let you repeat text or graphics frames on every page.

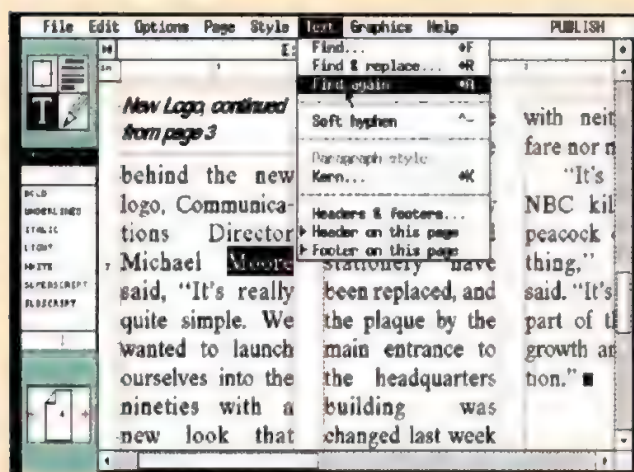
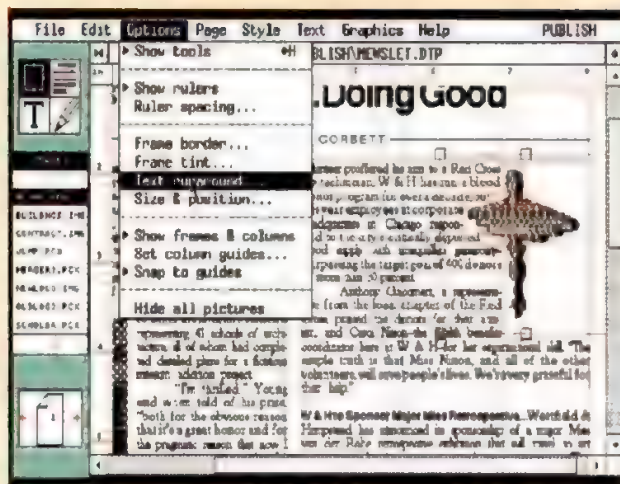
Publish It! will import ASCII text or files from several standard word processors. In addition, an assortment of word processing functions makes it easy to edit copy within the program. You can cut and paste text anywhere in a document, or execute a search-and-replace throughout linked frames.

TAGGING TEXT

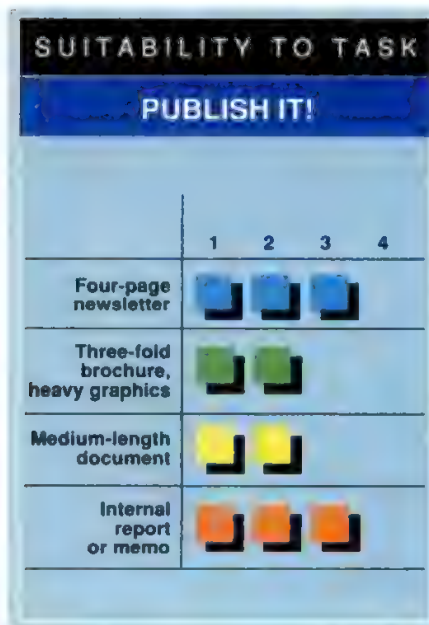
Formatting text requires that you tag each paragraph with a style that defines the font, leading, indents, tabs, justification, and line spacing. Tagging text is a flexible procedure, because you can create styles on the fly, select them from a menu, or assign them to function keys.

Kerning is limited, in the sense that it is manual and applies only to letter pairs, making this a move suitable tool with which to manipulate headlines, rather than body copy. *Publish It!*'s hyphenation feature, which relies on an algorithm to break words at the end of a line, does take into

With *Publish It!*, you can group clear or opaque frames together, and you can turn text runaround on or off. A combination of opaque and clear graphics frames permits special effects, such as the text running around this irregularly shaped graphic.



Publish It! can search for a text string through all linked frames and then highlight the target string. It can also perform a global or prompted search-and-replace.



account a dictionary of exceptions. You can add words that you don't want broken, such as the company name "W&H" from our test newsletter, to the simple ASCII list.

With seven high-quality typefaces for the LaserJet, including Times Roman and Helvetica precompiled in ten sizes, *Publish It!*'s font-handling capabilities are impressive.

Although a runtime version of the GEM operating system comes bundled with *Publish It!*, if you want access to Bitstream fonts, you'll need to invest an additional \$49.95 for Digital Research's *GEM/3 Desktop*, which includes the correct *Fontware* installation kit. Font installation is fairly painless: you follow Bitstream's instructions to create the fonts, then run the Fontwidth utility from the DOS prompt to alert *Publish It!* to the presence of Bitstream bitmaps.

Publish It! will display Bitstream's

screen fonts, and if you install bitmapped bold and italic printer fonts, it will automatically use them instead of altering the base font. The program also includes true PostScript support for all the resident fonts of the LaserWriter Plus, though you'll have to do without corresponding screen fonts for some sizes.

In addition to an impressive array of drawing features, which includes geometric primitives and a freehand drawing tool, *Publish It!* handles imported graphics with a minimum of fuss. It automatically scales .GEM, .IMG, .PIC, and .PCX files to fit a graphics frame. Further scaling, stretching, or cropping manipulations are only a click and drag away.

Publish It! restricts the size of the graphics it imports to the amount of free RAM available. Still, at about 200K on a 640K system, this is less of a constraint than it might first appear. More seriously, the program cannot interpret the most re-

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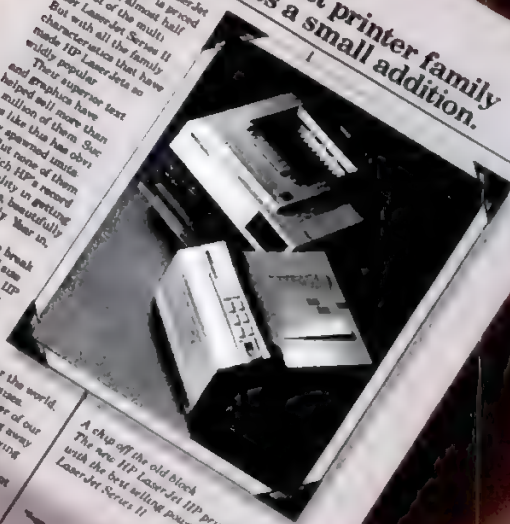
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LaserJet Series II \$2695.
Dealer prices vary.**

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A step off the old block. The new HP LaserJet IIP printer (front) with the best-selling powerhouse LaserJet Series II.

*Suggested U.S. list price.

The new HP LaserJet IIP printer.

or landscape configurations. At four pages a minute. From one or two paper bins (the second is optional).

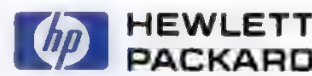
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LOW-COST DESKTOP PUBLISHING PROGRAMS: SUMMARY OF FEATURES

Products listed in ascending price order

If you aren't yet convinced that a low-cost desktop publishing program could meet your needs, compare the products listed here with the high-end programs we reviewed in "Power Publishing" (*PC Magazine*, December 27, 1988). Not one of the programs in the present roundup claims to be the equal of *Ventura Publisher* or *PageMaker*. In general, you'll find that low-cost programs don't handle graphics with the sophistication of high-end programs, because they lack the intelligent filters and powerful memory-management techniques necessary to import vector graphics or to edit high-resolution bitmapped images.

Network support and drivers for color output devices are also understandably absent. And, sadly, all of these low-end programs fall short when it comes to interpreting tabular, database, or spreadsheet files. Automatic tables of contents and index generation are features even *PageMaker* lacks. In fact, other than *Ventura*, the best bet for desktop publishing that involves these tasks might be a graphical word processor like *Word for Windows*.

Yet for laying out text-oriented documents, and for access to high-resolution downloadable fonts, the programs reviewed here are worth every penny they cost. At prices ranging from \$129 to \$299, they provide elegant layout tools, as well as features like search-and-replace that may eventually migrate up to the high-end programs—if we are lucky.

To keep this features table to a manageable

size, we are emphasizing aspects that differ from one package to the next. The following paragraphs explain some traits they generally have in common.

OPERATING ENVIRONMENT

- None of the DTP packages offer compatibility with OS/2 or the Presentation Manager.

HARDWARE REQUIREMENTS

- For packages that run under the GEM environment, Digital Research offers drivers for a number of DTP-specific monitors. Thus, you may be able to use a monitor not mentioned in the table.

INSTALLATION

- None of the programs alter the AUTOEXEC.BAT or CONFIG.SYS file, although *Finesse* creates a file called FINESSE.BAT.

GENERAL INTERFACE

- All of the packages permit WYSIWYG preview and editing.

PAGE LAYOUT

- None of these packages facilitate grouped frames (as opposed to linked frames).
- All of the packages permit unequal column widths.
- All of them offer automatic text reflow and automatic text wrap around graphics, and allow text to jump over columns or graphics.
- All of them store text overflow.
- None of these packages facilitate automatic indexing, tables of contents, footnoting, figure numbering, or "continued" lines.

- All of them offer on-screen rulers and a clipboard feature.

TEXT FORMATTING

- None of the packages allow editing of kerning tables.
- None of them permit text to be rotated except in 90-degree increments.
- None allow you to specify fractional point sizes for type.
- All of them import ASCII text.

GRAPHICS FEATURES

- All of the packages allow you to construct rules (both black on white and white on black) and rectangles.

PRINTER SUPPORT

- All of these packages provide black-and-white output; none offer full color.
- All of the packages permit output to laser printers such as the Apple LaserWriter IINT and IINTX, the Hewlett-Packard Series II, and their compatibles.
- All permit output to common dot matrix printers such as the Epson FX and LQ series and the IBM Proprinter. All except *Finesse* will drive the NEC Pinwriter series.
- None of them support film recorders or typesetting equipment.
- None of the packages offer networking support.

	PFS:First Publisher \$129.00	Springboard Publisher \$129.95	Express Publisher \$149.95	Finesse \$179.00	Publish It! \$199.00	PageBuilder \$295.00	GEM Desktop Publisher \$299.00
OPERATING ENVIRONMENT							
DOS version	2.0 or later	3.0 or later	3.0 or later	2.1 or later	3.0 or later	3.0 or later	2.1 or later
GEM	☐	☐	☐	☒	☒	☐	☒
Microsoft Windows	☐	☒	☐	☐	☐	☐	☐
HARDWARE REQUIREMENTS							
Hard disk required	☐	☒	☒	☒	☐	☒	☐
Mouse supported	☒	☒	☒	☒	☒	☒	☒
DTP-specific monitors supported	None	None	None	Genius, Wyse 700	None	None	Genius, Wyse 700
Disk and memory usage:							
Disk space required	2MB	1MB (with Windows installed)	2MB	1MB	1.2MB	4.5MB	2MB
Conventional RAM required	512K	512K	640K	640K	640K	640K	640K
LIM EMS 4.0 supported	☐	☒	☒	☐	☐	☒	☐
Extended memory supported	☐	☒	☒	☐	☐	☐	☐
INSTALLATION							
Automatic INSTALL program	☐	☒	☒	☒	☒	☒	☒
Disk format supplied (5.25- or 3.5-inch)	Both	5.25-inch	Both	5.25-inch	Both	5.25-inch	Both
Creates directories	☐	☒	☒	☒	☒	☒	☒
GENERAL INTERFACE							
Menu-driven	☒	☒	☒	☒	☒	☒	☒
Command-driven	☒	☐	☐	☒	☐	☒	☐
Undo (one level deep)	☒	☒	☒ (graphics only)	☒	☐	☒	☐
Zoom	☐	☒	☐	☒	☒	☒	☒

☒—Editor's Choice ☒—Yes ☐—No

CONTINUES

DESKTOP PUBLISHING
LOW-END PROGRAMS



LOW-COST DESKTOP PUBLISHING PROGRAMS: SUMMARY OF FEATURES

Products listed in ascending price order

	PFS:First Publisher	Springboard Publisher	Express Publisher	Finesse	Publish It!	PageBuilder	GEM Desktop Publisher
PAGE LAYOUT							
Maximum pages per document	99	999	32	16	Limited only by disk space	50	99
Maximum page size (inches)	8.5 x 11	8.5 x 14	11 x 14	8.5 x 14	8.5 x 14	8.5 x 14	8.5 x 14
Inserts/removes pages	■	■	■	■	■	■	■
Rearranges pages	□	■	□	□	□	■	□
Mother/daughter frames	□	■	■	□	■	■	□
Linked frames	□	□	■	■	■	□	□
Pasteboard metaphor	□	■	□	□	□	□	■
Maximum number of columns	4	9	8	Unlimited	Unlimited	Unlimited	4
Custom page size	□	□	■	■	□	■	□
Creates new pages for automatic text flow	■	■	□	□	□	□	□
Automatic headers/footers	□	□	□	■	■	■	■
Automatic page numbering	□	■	□	■	■	■	■
Automatic widow and orphan control	□	■	□	□	□	□	□
Ruler measures available	Inches	Centimeters, inches, pixels	Centimeters, inches, picas	Centimeters, inches	Centimeters, inches, picas, points	Inches	Inches, picas
Independent x and y rulers	□	□	□	□	□	■	□
Shows cursor position on ruler	□	■	■	□	■	□	□
Shows cursor coordinates	□	□	□	□	□	□	■
TEXT FORMATTING							
Links page layout to separate text files	□	■	□	□	□	■	□
Merges text from several files	■	■	■	■	□	□	□
Allows embedded type codes in text	□	□	□	□	■	■	■
Stylesheets	■	□	■	■	■	■	■
Hyphenation (using dictionary or logic)	□	□	■ (logic)	■ (logic)	■ (both)	■ (logic)	■ (logic)
Hyphenates foreign languages	□	□	□	■	□	□	■
Kerning tables	□	□	■	□	□	□	□
Manual kerning:							
Display type	□	■	□	■	■	□	■
Individual lines	□	■	□	□	□	□	■
Individual words	□	■	□	■	□	□	■
Increments of leading	Points	Pixels	Points	Points	Points	Fractions of a point	Hundredths of an inch
Tabs	□	■	■	■	■	■	■
Tab leaders (.....)	□	■	□	□	■	□	□
Vertical justification	□	□	■	□	□	□	□
Maximum typefaces per document	14	6	16 (for HP Laser- Jet Series II)	Unlimited	8	Unlimited	8
Superscripts and subscripts	□	■	■	□	■	□	□
Allows downloadable fonts:							
Adobe	□	□	■	□	□	□	■
Bitstream	■	■	□	■	■	□	■
Compugraphic Intellifonts	□	□	■	□	□	□	□
Displays soft fonts on-screen	■	□	■	■	■	□	■
Type can be scaled within program	□	□	■	□	□	□	□

□—Editor's Choice ■—Yes □—No

CONTINUES

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DESKTOP PUBLISHING LOW-END PROGRAMS

FACT FILE EDITOR'S CHOICE

Publish It!
Version 1.12
Timeworks Inc., 444
Lake Cook Rd.,
Deerfield, IL 60015-
4919; (312) 948-9200.
List Price: \$199.
Requires: 512K RAM
with CGA, or 640K RAM
with Hercules, EGA, or
VGA graphics adapter;
hard disk with 1.2MB free, or two floppy disk
drives; DOS 3.0 or later. Mouse recommended.
In Short: *Publish It!* is low-cost DTP without
compromises. Though graphics import is weak,
the formatting, layout, and downloadable font
capabilities are exemplary for an under-\$200
product.



cent versions of the .PCX format, which kept it from importing some of our test images. Yet the high-resolution photo on page 1 of our sample newsletter imported and printed without a problem. Timeworks plans to add support for TIFF and .EPS files early this year.

EXTRA WORK

Publish It! does have its shortcomings, but the features it lacks generally won't put anything out of your reach—they'll just make for a little extra work. For example, you can't create multiple text columns within a frame; instead you have to flow text into separate frames placed side by side. But a flexible column-guide feature, with nine columns per page and automatic gutters, makes it easy to position frames even in the most complex layouts.

In the same way, preserving column alignment in an imported .PRN file re-

quires that you use an additional utility program from Timeworks that prevents *Publish It!* from stripping out the spaces between text or numbers, but it works only with monospaced typefaces. Without this you'll have to retype tables. And though *Publish It!* does support left, right, center, and decimal tab alignment, setting up the tabs in a full-screen, text-only dialog box is anything but interactive.

You'll want to think twice before you tackle a very long document with *Publish It!*: since the program won't automatically add pages and flow text into them, you have to create and fill each page manually. On a more positive note, the size of a publication is limited only by disk space, and *Publish It!* did successfully buffer our 25-page text file during testing.

For shorter documents, you can rest assured that *Publish It!* won't make you

CONTINUES

CIRCLE 414 ON READER SERVICE CARD



LOW-COST DESKTOP PUBLISHING PROGRAMS: SUMMARY OF FEATURES

	PFS:First Publisher	Springboard Publisher	Express Publisher	Finesse	PC Publish It!	PageBuilder	GEM Desktop Publisher
TEXT FORMATTING							
90-degree rotation	■	□	■	□	□	■	□
Combined horizontal and vertical text	■	□	□	□	□	■	□
Reverse type	■ (graphics mode only)	■ (graphics mode only)	■ (graphics mode only)	■	■	□	□
Tinted type (gray or colors)	□	□	□	□	□	□	■
Point size range	6-72	9-72	6-144	6-99	4-99	3-72	6-720
Text editing:							
Edits text globally (search-and-replace)	□	□	■	■	■	■	□
Changes type specs globally	□	□	■	■	■	■	□
Changes paragraph form globally	□	□	■	■	■	□	□
Text import:							
DCA	■ (formatted)	□	■ (formatted)	□	□	□	■ (formatted)
GEM Write	□	□	□	■ (unformatted)	□	□	■ (formatted)
Microsoft Word	■ (formatted)	■ (unformatted; Version 4.0 only)	■ (formatted; Version 5.0 only)	■ (unformatted)	■ (formatted; Version 4.0 only)	□	■ (formatted)
MultiMate	■ (formatted)	■ (unformatted)	□	□	□	□	■ (formatted)
WordPerfect	■ (formatted)	■ (unformatted)	■ (formatted)	■ (unformatted)	■ (formatted)	□	□
WordStar	■ (formatted)	■ (unformatted)	■ (formatted)	■ (unformatted)	■ (formatted)	□	■ (formatted)
Other word processors	PFS:First Choice, Professional Write, Wang PC	Windows Write	Microsoft Works (Version 1.x to 2.0)	None	Beyond Word Writer, FirstWord Plus, Quintet, Word Writer PC	None	None
Numerical/tabular import	□	□	□	□	□	■ (.DIF)	□
GRAPHICS FEATURES							
Vector-based graphics import:							
AutoCAD (.DXF)	□	□	□	□	□	■	□
Encapsulated PostScript (.EPS)	□	□	■	□	□	□	□
GEM vector (.GEM)	□	□	□	■	■	□	■
Bitmapped graphics import:							
GEM Paint (.IMG)	□	□	■	■	■	□	■
Windows Paint (.MSP)	■	■	□	□	□	□	□

□—Editor's Choice ■—Yes □—No

CONTINUES

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Right Time To
Move Up To
Your Own ZEOS[®]
386[™] SX

Details Inside.



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for only
\$1395!

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I understand my 16MHz 386SX system will include the following features as advertised here: 32MB hard drive, Teac® 1.2 MB floppy disk drive, 14" flat screen monitor/tilt and swivel base with Hercules® monochrome graphics controller, 512K of memory expandable to 16MB, dual high speed hard/floppy controller with 1:1 interleave, 2 serial, one parallel and one game port, rugged ZEOS 5-bay case, ZEOS R/S keyboard. Plus your 30 day absolute satisfaction guarantee, one full year warranty and 24-hour a day Toll Free technical support. I understand the cost of this system is only \$1395 plus freight.

INCREDIBLE UPGRADE SPECIAL! SAVE OVER \$200.

Same great system upgraded to include 14" VGA Color with 16-bit VGA Graphics Card, 1MB memory and DOS 4.01. Only \$1995 complete!

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The Upgrade Special allows me to order your three most popular upgrades as a package for even greater savings. I understand I will receive the same great ZEOS 16MHz 386SX system upgraded to include the ZEOS 14" VGA Color Monitor, full 16-bit VGA controller card, 1MB of memory plus DOS 4.01. Complete for only \$1995 plus freight!

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If you order by mail, upon receipt your order will be assigned to your own Personal Systems Consultant. Your Systems Consultant will have a copy of your order at his/her desk. If you have any questions or wish to speak with your Consultant call the ZEOS Sales Department. When you call, indicate you placed an order by mail. To locate your order, all we'll need is your name and ZIP code.

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MasterCard, VISA orders are processed immediately. Orders paid by Cashier's Check or U.S. Postal Money Order will be processed immediately. Any other checks will require up to three weeks to clear before your order can be processed (if sending a check use an envelope or be sure all edges of this order form are taped shut). COD orders must be accompanied by a \$200 partial payment in the form of MasterCard, VISA or check. Your COD amount (less the \$200 advance payment) will require a Cashier's check upon UPS delivery of your system. If you have any questions, please call 800-423-5891.

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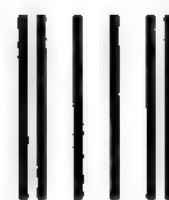
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 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



Foldout slip-sheet



GbsSlipSheet-001

Inverted Foldout slip-sheet

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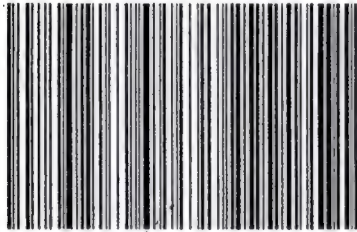
3. Slice the folded edge

4. Close the page and slip-sheet



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Inverted Back



Gbs5lipBack-0018

Back

1. Follow instructions on the other side

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Yes! You can buy a complete ZEOS '386SX hard drive system *right now* for only \$1395.

This top quality ZEOS 386SX delivers 16MHz of Rock Solid 32-bit processing power. Now you can take advantage of all the new 32-bit software. *Plus* you can run all the '286 software you already have, perhaps faster than it's ever run before.

Nothing can touch it. The ZEOS 386SX gives you Guaranteed Value you simply can't get anywhere else. It is without a doubt tomorrow's computer today. And ZEOS is America's premier '386 systems manufacturer. After all, *PC Magazine* selected ZEOS '386 systems "*For Overall Excellence*" above all others. And they call the ZEOS 386SX "a terrific choice". Why? Four key reasons:

Performance. Quality.



YOU WANT PERFORMANCE? THIS IS IT!

ZEOS has invested literally thousands of hours creating the world's finest 386SX.

And as the benchmarks indicate, the ZEOS 386SX is an awesome performer.

This is no rehashed '286 design. It's a true '386 from the ground up. A Rock Solid Investment that runs circles around everything else out there.

PC LABS BENCHMARK SERIES

	Instruction Mix	Floating Point Calculation
ZEOS 386SX/16	4.08	6.98
IBM PS/2 Model 50Z	5.68	11.21
Compaq Deskpro 386S	4.48	9.67

QUALITY YOU CAN COUNT ON. ZEOS QUALITY.

Your ZEOS 386SX is designed and manufactured right in our own laboratories. We have used only the *very best* components available. Top quality throughout. Attention to every detail.

Take our power supplies for instance. They cost us nearly twice that of many other suppliers. But the failure rate is incredibly low. Lower than any we've seen. Your system will be powered by the very best!

And we use only genuine Hercules® brand monochrome graphics cards too. They cost more than double what others might pay for their cheaper "Hercules compatible" cards. But Hercules® is quality. Quality you deserve.

Even the floppy drive, yours will be a genuine Teac®. They cost about 30% more than many other brands. They work a lot better too. ZEOS systems. Quality from the ground up.

AN INCREDIBLE PRICE FOR AN INCREDIBLE MACHINE.

Incredible is the word! How can we build your

10 Good Reasons To Buy From ZEOS®

Reason #1

"Overall Excellence"

As *PC Magazine* said "Price is always a consideration. So are benchmark test results. But both factors can be deceiving, which is why we consider them in the context of other aspects that will make the difference months and years down the road."

These are the attributes which *PC Magazine* used in awarding ZEOS the coveted Editor's Choice, not once but three times. And "Overall Excellence" are the very words *PC Magazine* used in describing ZEOS systems comparing them to all others.

Reason #2

Dazzling Performance.

In one recent review, *PC Magazine* awarded ZEOS Editors Choice. "The ZEOS '386 blows away every other computer... a smart choice" is what they said. And in another review, *Government Computer News* said the ZEOS 33MHz '386 is "arguably the fastest MS-DOS and OS/2 micro in the world"

Dazzling Performance is built into every ZEOS system. It's a key component of ZEOS Overall Excellence.

Reason #3

Exceptional Quality.

PC Resource Magazine put it this way, "ZEOS... provides quality comparable with IBM or Compaq and does so for about 70% of the price." ZEOS uses only the very best components. And every system is fully tested and burned-in right in our own labs.

Reason #4

Value.

InfoWorld says, "We find the ZEOS '386 an excellent value. Speed: Excellent. Compatibility: Excellent.



Value: Excellent!"

Personal Computing said, "ZEOS... is the best value we've come across... its performance is right up there with the slickest, most expensive PCs you can buy!"

Reason #5

Warranties and Guarantees.

ZEOS believes in its products. That's why we offer each and every customer our 30 Day Absolute Satisfaction Money Back Guarantee, no questions asked. Plus, our One Full Year Limited Warranty and Express Parts Replacement Policy. Optional On Site Service is available too. Call for details.

Reason #6

24 Hour Toll Free Technical and Sales Support.

At ZEOS, the customer is #1. That's why we're open around the clock. For your convenience. If you buy a product from us we feel we should be there to help, 24 Hours a day. Our Help Lines are Toll Free too. Because you shouldn't have to pay for the call.

Reason #7

Experience.

Almost unique in the mail order computer industry, ZEOS maintains its own chip level Research and Development staff. In addition to Systems Manufacturing, we also operate our own Board Level Manufacturing facility.

ZEOS has been involved in Research and Development since our incorporation back in 1981. Our strong and experienced Research, Manufacturing and Technical Staff translates into superior factory direct computer systems for you.

Reason #8

A Sterling Reputation.

In magazine after magazine and review after review ZEOS systems are sighted for Overall Excellence, for Excellent Value, as the Right Choice and so on. All of this is flattering but the most important thing is this: What do our customers think? Frankly, they love us. The systems and the support. That means more to us than anything.

Reason #9

Easy to Buy.

ZEOS systems are easy to buy. You can pick up the phone any time of the day or night and order your new ZEOS computer. And we accept MasterCard, Visa, and Corporate Purchase Orders from Fortune 1000 Companies, Colleges, Universities and Governments. Complete Leasing Programs are available as well.

And now the Z-CARD! It's your very own ZEOS Credit Card and you can apply today. With the Z-CARD you can charge your ZEOS purchases and pay in easy monthly installments. It's just like a Bank Card. Why not apply for your Z-CARD now!

Reason #10

You're Going to be Very Satisfied.

When it comes right down to it, you're going to be very satisfied with your new ZEOS system. Our goal is your complete satisfaction. And that's our commitment to you. To quality. To performance. To reliability and support. To *Value*. We don't just say it, we *Guarantee it!*

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a. Your Personal Information

Requested Line of Credit \$ _____

Your Name _____ Date of Birth _____
First Initial Last Mo. Day Yr.

Present Address _____
Street Apt. # City State Zip

Social Security Number _____ Home Phone _____

Date of Residence _____ Monthly Payment \$ _____ ☐ Buy ☐ Rent ☐ Other
Month Year

Previous Address _____

Dates of Residence _____
From To

Your Employer _____
(If self-employed, see rear panel.)

Date of Employment _____ Position _____
Mo. Yr.

Monthly Income _____
Gross \$ Net \$

Employer's Address _____
Street

City _____ State _____ Zip _____ Business Phone _____

Previous Employer _____ Address _____

Dates of Employment _____
From To

Other Income _____ I have received since (Date) _____
Income from alimony, child support or separate maintenance payments need not be disclosed if you do not wish to have it considered as a basis for repaying this obligation.

Monthly Income _____
Gross \$ Net \$

Name and Address of Nearest Relative Not Living With You _____

Relationship _____

b. Credit Information

Include joint information, if joint account requested.

Bank Account _____ ☐ Checking ☐ Savings
Bank Name

Address _____

Bank Account _____ ☐ Checking ☐ Savings
Bank Name

Address _____

Bank Loan Reference _____
Bank Name Address

Payment _____ Balance _____

Bank Card Reference _____
Bank Name Address

_____ ☐ VISA ☐ Mastercard Payment _____ Balance _____

(please check appropriate box):

- ☐ **Joint Credit** with another person. Complete all information.
☐ **Individual Credit** but rely on income or assets of another person as a basis for repaying the credit requested. Complete all information
☐ **Individual Credit** Complete sections "a" and "b" only.

Please complete all appropriate sections, *providing at least two years' residence and employment history*. This will enable your information to be processed as quickly as possible. If you are self-employed, please be sure to complete section "d" below.

Other Credit Card Reference _____
Bank Name Address

Payment _____ Balance _____

Other Credit References _____ Payment _____ Balance _____

Account No. _____ Expires _____

Driver's License No. _____ State _____ Expires _____

c. Joint Personal Information

Joint Name _____
First Initial Last

Date of Birth _____ Social Security Number _____
Mo. Day Yr.

Address _____
Street Apt. #

City _____ State _____ Zip _____

Date of Residence _____ Home Phone (_____) _____
Mo. Yr.

Employer _____

Date of Employment _____ Position _____
Mo. Yr.

Monthly Income _____
Gross \$ Net \$

Employer's Address _____
Street

City _____ State _____ Zip _____ Business Phone _____

d. Self-Employed Information

Complete this section only if you are self employed.

Business Name _____

Business Address _____

☐ Proprietorship ☐ Corporation ☐ Partnership Business Phone (_____) _____

Description of Business _____

Your Position _____ In Business Since _____

Your annual income from business _____ Business' annual income _____
(gross) (net)

You must provide at least one of the following:

1. Business Bank _____

(_____) Telephone _____ Personal Banker's Name _____

2. Accountant's Name _____

(_____) Telephone _____

3. Financial statement on business attached.

(EXC. AK, & HI)

compromise your work. Both in terms of the ease with which it recreated the complex formats and the fidelity with which the screen representations matched the high-quality hard copy, *Publish It!* did an exemplary job on the PC Labs test newsletter. The program's modest price belies its exceptional publishing prowess.

Springboard Publisher

by Robert Kendall

Low-end DTP is one of the few areas in which more programs run under Digital Research's *GEM* interface than under *Microsoft Windows*. But, as the only *Windows*-based program in our roundup, Springboard Software's \$129.95 *Spring-*

board Publisher tries to balance the scales. To make *Windows* aficionados feel at home, the program not only imports *Windows Paint* and *Windows Write* files, but also includes simple word processing features that resemble *Windows Write* and a *Windows Paint*-like graphics editor.

The real measure of this program is, of course, how well it uses the *Windows* environment. Unfortunately, after working with *Springboard Publisher*, it's easy to see why competitors steer clear of *Windows* and choose the more efficient performance offered by *GEM*. *Springboard Publisher* is excruciatingly slow: just flipping a page of the PC Labs test newsletter took 37 seconds. Only the most patient should attempt to use this product on an 8-MHz AT or create documents longer than one or two pages.

DISILLUSIONED WITH WINDOWS

If you think that working in *Windows* must automatically give *Springboard Publisher*

To make *Windows*

aficionados feel at home, *Express Publisher* includes word-processing features and a graphics editor resembling *Windows Write* and *Windows Paint*.

access to high-resolution graphics, think again. *Springboard Publisher* failed all of our graphics import tests. It accepts only .PCX and *Windows Paint* files, failing



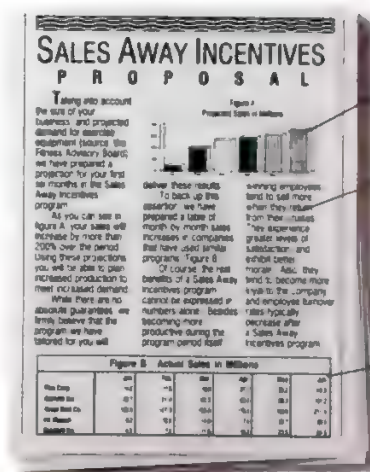
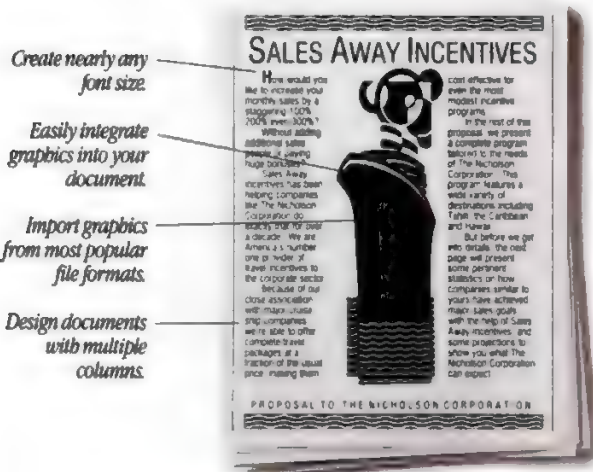
LOW-COST DESKTOP PUBLISHING PROGRAMS: SUMMARY OF FEATURES

	PFS:First Publisher	Springboard Publisher	Express Publisher	Finesse	Publish It!	PageBuilder	GEM Desktop Publisher
GRAPHICS FEATURES							
PC Paintbrush (.PCX or .PCC)	■	■	■	■	■	■	□
Tagged Image format (.TIF)	□	□	■	■	□	□	□
Other	MacPaint (.MAC), internal screen-capture utility	None	CompuServe (.GIF), MacPaint (.PNT or .MAC)	Internal screen-capture utility	None	None	None
Built-in graphics elements:							
Rounded corners	□	■	■	□	■	□	■
Circles and ovals	□	■	■	□	■	■	■
Polygons	□	■	□	□	■	□	□
Number of rules	4	4	4	14	8	Unlimited	12
Number of hatch patterns	None	22	60	None	36	5	8
Number of gray shades	None	None	32	6	None	5	None
Freehand-drawing options	■	■	□	□	■	■	□
Graphics manipulation:							
Fixed scaling	□	□	□	□	□	□	■
Continuous scaling	■	■	■	■	■	■	■
Cropping	■	■	■	■	□	□	■
Rotation	■	■	■	□	□	□	□
Pan	□	□	□	■	□	□	■
Zoom	■	■	□	□	■	□	■
PRINTER SUPPORT							
Maximum number of output devices installed	1	Unlimited	10	2	4	1	3
Output devices can be assigned to different ports	□	■	■	■	■	□	■
PostScript output:							
Windows PostScript driver	□	■	□	□	□	□	□
Proprietary PostScript driver	□	□	■	□	□	■	■
Unotronic PostScript driver	□	■ (300 dpi)	□	□	□	□	□
Plotters	□	□	□	□	□	□	■ (HPGL, HP 7470, HP 7475)
Two-color output	□	□	□	□	□	■	□

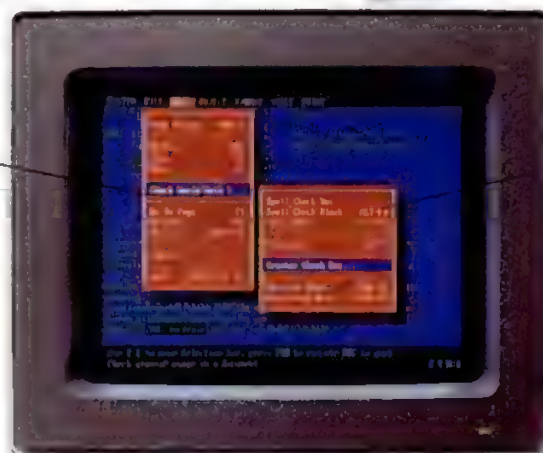
■—Editor's Choice ■—Yes □—No

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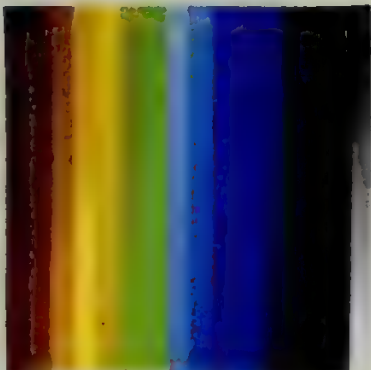
CIRCLE 519 ON READER SERVICE CARD

Most VGA monitors this colorful,



image created on the Samsung VGA-GraphicMaster™ color monitor using RIX Softworks, Inc. Software.
Unretouched photograph. © 1989, Samsung Information Systems America, Inc.

cost 20% more.



The Monarch butterfly is one of Mother Nature's most splendid creations.

And as you can see, Samsung's new high resolution VGA color monitor vividly brings to life its rich colors and striking contrasts.

Capable of displaying an unlimited palette of colors, the VGA-Graphic Master's™ 14-inch screen with 640 x 480 resolution creates images of superb quality. The tight .31mm dot pitch keeps everything from graphics to type super-clear and razor sharp.

Add to that convenient, up-front controls, a non-glare screen and tilt-swivel base for comfortable viewing, and you've got an array of features that add up to a monitor costing hundreds more.

But this, of course, should come as no surprise. Because along with outstanding performance, Samsung has for years enjoyed a reputation for unmatched value and reliability. All of which have gone a long way toward making Samsung the world's largest monitor maker, with over 8 million units sold.

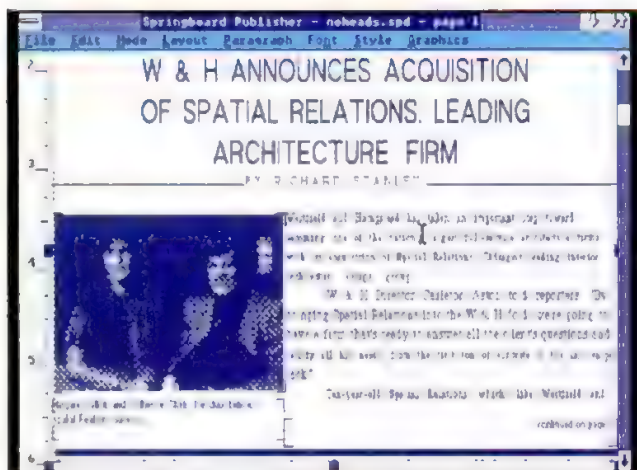
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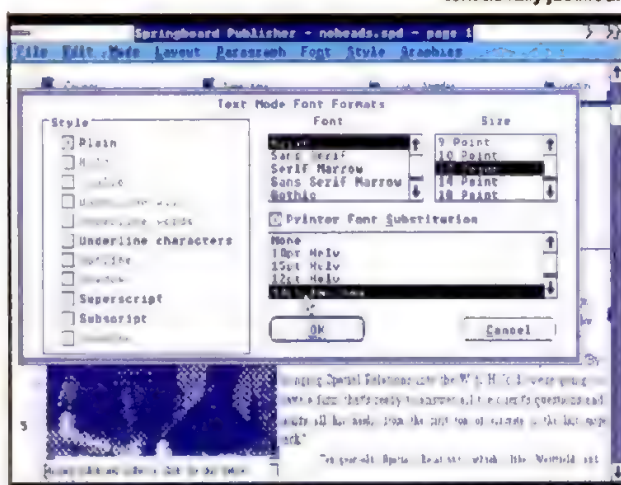
SAMSUNG

CIRCLE 366 ON READER SERVICE CARD



Springboard Publisher doesn't provide a true WYSIWYG display of cartridge-based or downloadable soft fonts. Note the dots that **Springboard** has inserted beneath the downloaded font. Not only is the screen font smaller than the printer font (hence the dots), but **Springboard** also fails to display the text as fully justified.

To access hard or soft printer fonts in **Springboard Publisher**, you must use a process called font substitution that swaps high-resolution fonts for low-resolution screen fonts at printout time. In this dialog box, you select a **Springboard** screen font to correspond to each printer font in your document.



even to support the Windows Metafile Format. To its credit **Springboard Publisher** did attempt to read our high-resolution graphics files. However, when faced with high-resolution .PCX images, the program placed only a small portion of the picture into the document. It won't automatically scale an imported image to fit a frame. And achieving the right size for an imported picture is a matter of pure guesswork on your part, since you must shrink the image manually without the benefit of an on-screen ruler.

Even worse is **Springboard's** implementation of high-resolution fonts. No 300-dot-per-inch fonts are bundled with the program; instead you must print using **Springboard's** 72-dpi screen fonts. Though you have access to several type styles in a fair selection of sizes, the resolution is well below that of most 24-pin dot matrix printers.

The program will access Hewlett-Pack-

ard LaserJet cartridge fonts, the resident fonts of the Apple LaserWriter, and Bitstream fonts that have been installed for **Windows**. However, doing so will cost you a true WYSIWYG display because the program can't scale its own screen fonts and won't accept third-party downloadable font screen equivalents.

You must manually select the **Springboard** screen font that most closely approximates each printer font you want to use. If the printer font is larger than the screen font, **Springboard Publisher** will alert you by adding dots under the text on-screen, canceling out any hope of display clarity.

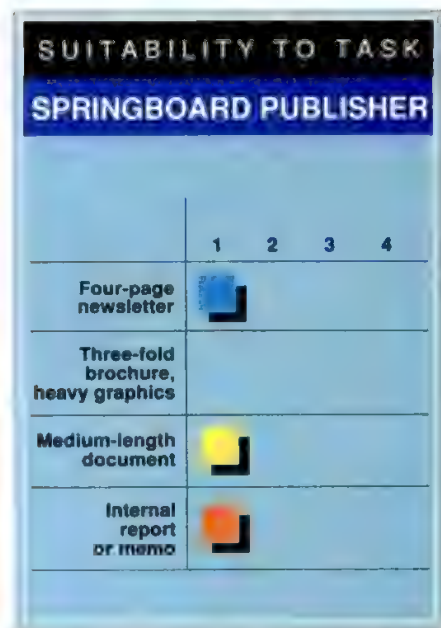
The instructions for configuring the program to work with Bitstream fonts is inadequate. Once installed, Bitstream typefaces appeared in the **Springboard** font substitution menu in the wrong sizes, although other **Windows** applications had no trouble accessing the same fonts correctly.

FLEXIBLE FRAMES

Springboard Publisher does provide a flexible layout technique that features independent frames for graphics and text. For example, unlike other low-end DTP programs in which text frames are synonymous with column width, **Springboard's** text frames can contain up to nine automatically sized columns. To create unequal column widths, you simply drag column guides with the mouse.

Springboard lets you import a long text file and add new pages as needed. Tab stops are easy to set; you position markers along an on-screen ruler. Automatic widow and orphan control, plus the ability to kern any selected section of type, let you fine-tune text flow.

Unfortunately, automatic text flow is limited to the story that resides on the base layer of a **Springboard** document. Since there is no way to link text frames, if more than one story jumps to a later page, you must cut and paste between frames and hope that format changes to the first frame



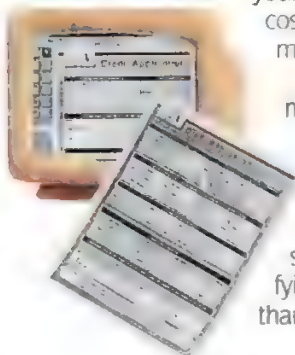
don't disturb continuity. Text will wrap around a frame automatically, but if the runaround pushes text to the right, you'll lose paragraph indents.

The program measures leading in pixels rather than points, gives you no indication of default leading for a font, and allows you to increase (but not decrease) line spacing. Without any hyphenation algorithms or discretionary soft hyphens, you are unfortunately forced to insert hard hyphens. Edit or format changes that influence line breaks make it necessary to de-

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CIRCLE 263 ON READER SERVICE CARD

lete these hard hyphens manually.

Moving around in a document is a real chore. There is no way to jump to a speci-

Springboard Publisher

lets you import a
long text file and add new
pages as needed.

Easily set tab stops, auto-
matic widow and
orphan control, and the
ability to kern any
selected section of type let
you fine-tune text flow.

fied page, so you must turn through each
page in slow succession. And if you decide
to work in *Springboard's* one and only
zoom mode, you'll be plagued by unneces-
sary screen redraws. In addition, if you

DESKTOP PUBLISHING LOW-END PROGRAMS

alternate between moving from page to
page and switching between magnified
and normal working views you can be
dumped to surprising locations. Your posi-
tion within a document is made more con-
fusing by a page number status indicator
that frequently indicates the wrong page.

As if these problems weren't enough,
an error message warning that the docu-
ment had reached its size limit prevented
us from adding the necessary formatting
elements to the PC Labs test newsletter.

PRINTER FLIGHT

Even with 2.5MB of RAM in a LaserJet
Plus, *Springboard Publisher* was unable to
print a full page of high-resolution fonts.
The partial pages that did print contained
Bitstream fonts marred by unattractively
wide letter spacing. Only by resorting to
the *Springboard's* ugly, jagged screen
fonts could we produce an entire page of
text and graphics.

Springboard Publisher's inadequate
font support, marginal graphics capability,
and lack of automatic hyphenation make it
unsuitable for business documents.



Springboard Publisher,

Version 1.0
Springboard Software
Inc., 7808 Creeknidge
Circle, Minneapolis, MN
55435; (800) 445-4780,
(612) 944-3915.

List Price: \$129.95

(includes runtime version 2.03 of *Microsoft
Windows*). One clip-art library (Education Series,
Holiday Series, or Assortment Series), \$5 with
package; \$39.95 each separately.

Requires: 512K RAM (640K recommended);
1MB free disk space if *Windows/286* or 386 is
already installed, or 3MB of disk space if runtime
version of *Windows* is used; DOS 3.0 or later,
CGA, EGA, VGA, MCGA, or Hercules graphics
adapter; mouse.

In Short: *Springboard Publisher* boasts that it is
the only *Windows*-based low-end DTP program
on the market.

However, its inability to display *Windows*
screen fonts, weak typographic capabilities,
severely limited support for imported graphics,
and lack of automatic hyphenation yield a very
poor return on the hardware investment
necessary to run *Windows* or any *Windows*-
based application.

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² 11 fonts each in portrait and landscape orientation

³ Registered trademark of Hewlett-Packard, Inc.



EDITOR'S CHOICE

• Publish It!

If you are looking for a program that is easy to use, provides flexible and powerful page-design tools, imports high-resolution graphics, supports downloadable fonts, and costs less than \$200, look no further than *Publish It!* from Timeworks.

Make no mistake, *Publish It!* isn't *PageMaker*; and improvements such as interactive tab rulers, the ability to import tabular material or spreadsheets, and better support for imported graphics would all be welcome. But for executives, managers, or secretaries who want to be self-sufficient publishers, this \$199 program packs more than enough power. *Publish It!* was the only program in this roundup that easily bridged the gap between our image-laden newsletter and a 24-page text-only document.

An honorable mention must go to Logitech's *Finesse*. Though not as feature-rich as *Publish It!*, what *Finesse* lacks in the way of drawing tools and large-file capabilities, it makes up for with a thoughtful, intuitive user interface. The \$179 price tag is more of a bargain than you might imagine because *Finesse* arrives bundled with four completely scalable Bitstream typefaces.

Both *Finesse* and *Publish It!* run under Digital Research's *GEM* interface. Both programs should benefit from DRI's planned *GEM* upgrade, which aims to reduce the current inconveniences surrounding graphics file import. By the time this article is in your hands, the *Hijaak* graphics conversion utility (from Inset Systems) should be a part of the *GEM* interface.

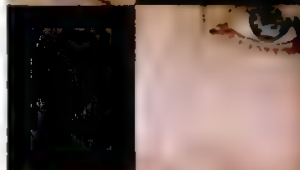
Though it would be more appropriate for composing community fliers, its need for fast, expensive hardware makes this product a poor choice for home use. ■

Robert Kendall is a frequent contributor to PC Magazine. Edward Mendelson, Bill O'Brien, Alfred Poor, Robin Raskin, and Luisa Simone are contributing editors of PC Magazine.

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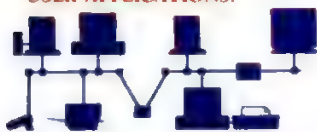
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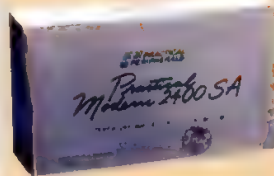
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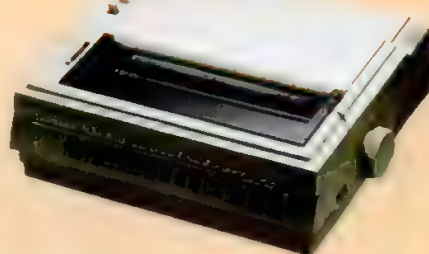
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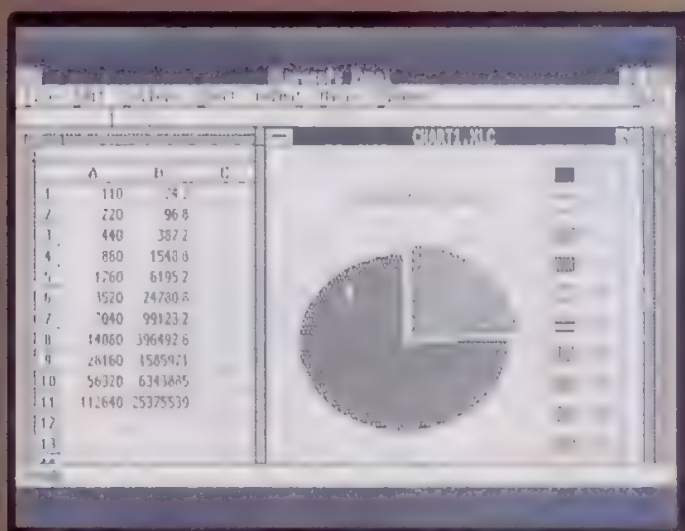
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LCD Panels

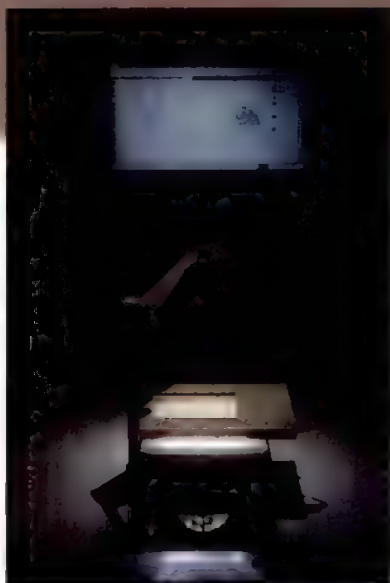
12 FOR THE ROAD

Sure, slides can make for a riveting presentation that you can take with you. But these 12 LCD panels offer the additional benefit of real-time demonstrations requiring less lead time—and less expense.

VIEWFRAME 11+2



VIEW



by Alfred Poor

Desktop presentation is more than an industry buzzword; it is one of the hottest, most exciting areas of innovation and development in the micro marketplace. But although you hear plenty about incredible animation, dynamic business graphics, and other aspects of the creative process, little is said about actually making the presentation. And let's face it—even the most eye-popping screens lose their impact when you have a dozen people crowded around a 13-inch monitor.

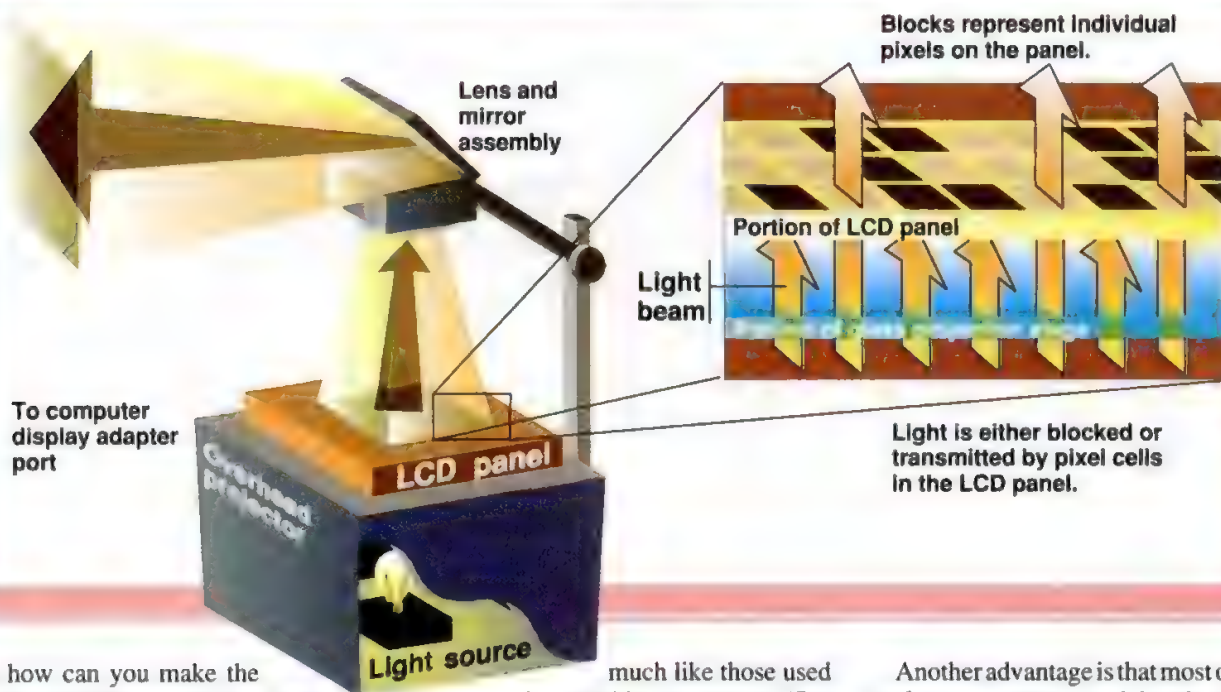


A CLOSER LOOK AT LCD PANEL TECHNOLOGY

by Alfred Poor

LCD projection panels are designed to sit on top of a standard overhead projector. The light from the projector shines up through the glass projection stage to the lens and mirror assembly that sits above; this focuses the image and reflects it toward the screen.

The LCD layer within the panel consists of a matrix of individual liquid crystal cells, one for each pixel. These individual cells can either block or transmit the light, depending upon the charge applied. The light that passes through is then reflected onto the screen so the image can be seen.



So how can you make the most of your efforts, presenting your work so that it can be seen by more than a few people at one time? You might use a film recorder to create slides, but this technique is expensive and requires plenty of lead time. And slides are static; you can't use them to demonstrate programs or present animated sequences.

In this article and the one that follows, we will explore two ways that you can get your desktop presentations onto the big screen. Here, we look at LCD panels, the low-cost and portable solutions to the problem.

THE TECHNOLOGY

An LCD panel is simple in concept. Though there is some variation in design among models and manufacturers, all the systems are quite similar. Basically, they are notebook-size panels that are placed on the projection stage of a standard overhead projector. A rectangular window in the middle of the unit holds a clear panel, and sandwiched between layers of glass (or plastic) is a liquid crystal display (LCD),

much like those used in portable computers. (See the sidebar "A Closer Look at LCD Panel Technology.")

These panels do not work with all overhead projectors; some of the new, lighter-weight projector designs sport a light mounted above the projection stage, relying on reflected light. This type of projector won't work with most LCD panels since they sit too high off the stage, and the angled light can produce a blurred or doubled image.

The LCD panels do function with projectors where the light is located in the bottom. The light from the overhead projector shines up through the panel and is displayed on a screen.

THE ADVANTAGES

LCD panels can be rather light, typically weighing in at less than 10 pounds, including an external power supply. This is because almost all the heavy components are part of the overhead projector: large cooling fans, lenses, mirrors, and sturdy housing.

Another advantage is that most offices, conference centers, and hotels already have overhead projectors on hand. This means that you can travel with just your LCD panel and be fairly certain you will have what you need at your destination. If you want to be absolutely certain, there are a number of overhead projectors—from companies like 3M, Eastman Kodak, and Buhl—that fold into a briefcase-size carrying case. With one of these, your LCD panel, and a laptop computer, you have all you need to stage your show.

Overhead projectors are relatively bright compared with some other technologies, and you can often use an LCD panel in a room with most of the lights on. In fact, if you are stuck without a projector screen, these LCD panels are usually bright enough to stage a display on a blank wall.

Since the panel hooks up directly to your computer, you can display your desktop presentation images directly on the screen. You can also demonstrate programs interactively, which is excellent for training purposes. There is no complicated setup or focusing involved, which means you

can move your equipment from room to room and still be ready to go in just a few minutes.

Perhaps best of all, the relatively simple technology used in LCD panels makes them attractive values. The models tested here range in price from \$895 to \$4,995, far less than large monitors such as the 37-inch Mitsubishi Diamond Scan, which lists for a cool \$7,599.

All these advantages have made LCD panels the projection technology of choice for many users. Teachers in schools and corporate trainers can mix text slides and live program demonstrations with ease. Sales representatives can carry their presentations with them and even work out bids or proposals on-screen as the client watches. And many users appreciate the

fact that they can make changes in their presentations right up until the last moment.

SOME PROBLEMS

LCD panels are not the perfect answer to the presentation dilemma, however. They have their problems, largely as a result of the limits of their technology.

One major problem for some of these products is their resolution. The first panels were strictly limited to CGA resolution; despite their courser images, some of these products still survive, in large part because many laptops are still not capable of higher-resolution images. (If you have a

laptop that you intend to use with an LCD panel, make sure to match the panel's capabilities with the signal your portable can produce.) Fortunately, among the high-end panels, you will now find various models that support VGA and Macintosh high-resolution modes.

Another problem is that most panels don't show true color. In fact, in this review, you'll read about the *first* LCD color panel. All the others are variations on a monochrome theme: older panel designs often project a blue image on a yellow background, or magenta and blue images on a yellow background. Newer designs have color-compensated LCDs, and these produce a black-on-white image.

Since these panels are all essentially monochrome displays, they must rely on

A CHECKLIST OF DESKTOP PRESENTATION TECHNOLOGIES

by Alfred Poor and Robin Raskin

In addition to LCD panels and data projectors (the two PC presentation tools we review in this issue), numerous other options are available to bring your desktop-computer presentations to bigger screens. Of course, the choices vary in terms of cost and benefits. Listed below are some of the main alternatives, presented in order of overall cost.

OVERHEAD TRANSPARENCIES FROM PLOTTERS OR PRINTERS

PORTABILITY: Light, but transparencies can get scrambled if dropped.

FLEXIBILITY: Easy to create (though plotters can be slow); easy to resequence.

REQUIREMENTS: An overhead projector (common in most meeting rooms). Screen preferred but dispensable in a pinch. Room need not be darkened much.

IMAGE QUALITY: Fair to good. Remember that laser printer output is only black and white, and plotters can produce uneven quality.

INVESTMENT: Price of plotter or printer (if you don't already own one).

PER-IMAGE COST: About \$0.60 and up per sheet.

35MM SLIDES PREPARED BY SERVICE BUREAU

PORTABILITY: Loaded in a carousel, slides are easy to carry and they stay in sequence.

FLEXIBILITY: At least a few days' lead time to create them, but once they are made, they are relatively easy to resequence.

REQUIREMENTS: A slide projector and screen, and a fairly dark room.

IMAGE QUALITY: Good to excellent.

INVESTMENT: None.

PER-IMAGE COST: About \$10 and up per slide.

LCD PANELS

PORTABILITY: Fairly light but bulky; the weight at least doubles if you bring along a laptop computer.

FLEXIBILITY: Using graphics and slide-show software, you can change sequence and edit images right up to the last minute; you can also run live programs on-screen.

REQUIREMENTS: An overhead projector and a slightly darker room than with standard overheads; screen preferred but not absolutely necessary.

IMAGE QUALITY: Poor to fair, depending on panel in use; most are monochrome, which is not nearly as good as vivid, full-color images.

INVESTMENT: About \$895 to \$4,995, plus cost of laptop if necessary.

PER-IMAGE COST: No extra cost.

IN-HOUSE 35MM SLIDES

PORTABILITY: Same as that of slides from a service bureau.

FLEXIBILITY: Shorter production time with in-house equipment.

REQUIREMENTS: Film recorder, slide projector, and screen; room must be fairly dark.

IMAGE QUALITY: Good to excellent.

INVESTMENT: \$2,000 to more than \$200,000.

PER-IMAGE COST: About \$1 per slide.

LARGE CRT MONITORS (35- TO 37-INCH)

PORTABILITY: Can be moved from room to room but are heavy.

FLEXIBILITY: They can hook directly to computer or VCR units, and they have the same last-minute-change capability as LCD panels.

REQUIREMENTS: Room need not be darkened much, if any.

IMAGE QUALITY: Excellent.

INVESTMENT: Approximately \$8,000.

PER-IMAGE COST: No extra cost.

DATA PROJECTORS

PORTABILITY: Typically mounted permanently; must be readjusted if moved.

FLEXIBILITY: They can hook directly to computer or VCR units, and they have the same last-minute-change capability as LCD panels.

REQUIREMENTS: Room must be dark.

IMAGE QUALITY: Good to excellent.

INVESTMENT: From \$2,500 (projectors with CGA resolution) to more than \$150,000 (high-quality light-valve projectors); VGA three-beam models range from \$8,500 to more than \$15,000.

PER-IMAGE COST: No extra cost. ■

HARDWARE

LCD PANELS

different techniques to represent colors. The better designs can display eight or more shades of gray, which are then mapped to different colors. Others use a dithering method in which patterns represent different shades. Some panels offer a choice between these two approaches, while others use combinations of gray shades and patterns. No matter what method is used, most panels offer some way to change the color-mapping so as to produce the most legible display for different combinations of colors.

A pair of related factors—brightness

Panels with good contrast tend to transmit less light overall, so they produce an image that is sharper but not as bright.

and contrast—also affect the quality of the projected image. Since the panels rely on the light of the overhead projector, brightness depends on how much of this light passes through the panel to end up on the screen. Contrast refers to the degree of difference between the light and dark parts of the image. As it turns out, panels that have good contrast tend to transmit less light overall, so they produce an image that is sharper but not as bright as other designs.

One other problem that affects the image quality is the fact that overhead projectors tend to produce a fair amount of heat. As the LCD layer in a panel gets hot, the light transmission qualities of the panel change. If the heat is evenly distributed, you can simply adjust the contrast control and maintain a high-quality image. If the heating is uneven, the changes will be uneven: adjusting one portion of the screen to optimal contrast may mean that the other portions of the screen become illegible.

This heat effect is called blooming, and panel manufacturers have devised a number of solutions. Most panels have

internal fans to cool the LCD layer, and some even have special infrared-absorbing layers to help dissipate the heat from the projector. As you will see in the reviews, some projectors are more successful at keeping cool than others.

THE DIFFERENCES

Since many of these panels are made by one manufacturer but sold under different labels, you will find some striking similarities among these systems. You will also, however, find a number of differences that could affect your buying decision. Keep in mind the following points when deciding on the LCD panel that's best for you.

First and foremost, be careful in your evaluation of our performance test results. Since many of the measurements rely on the subjective adjustment of the panels to what appeared to be the best contrast setting, there is considerable room for experimental error. Comparing the results for identical panels from different vendors indicates that this margin can be as large as 10 percent. Therefore, you should discount differences between panels where the results are within this band of uncertainty.

The major performance differences are in transmissivity and contrast; as mentioned earlier, you often have to sacrifice one to get the other. During the testing, we found that we preferred the panels with higher contrast over those with greater transmissivity, but the extra brightness of the latter may be more important in some applications.

Other differences lie in features and options. Most units have control panels that permit adjustments such as contrast settings and color-mapping palette selections. Some of the panels provide controls that are easier to find and more intuitive than the competition's. Many panels we tested also come with infrared remote controls that make it possible to activate these adjustments from a distance.

Some panels have provisions that permit you to hook up a monitor—in addition to the panel—adjacent to your overhead projector. Others have a monitor connector located on the computer end of the cable; this may indicate that the monitor needs to be some distance from the overhead. Still others have no provision for a monitor connection at all, although most of these panel manufacturers offered the

required cables or connectors as an extra-cost option.

On-screen help information guides you through the different controls on some systems. A number of other units include slide-show programs. One panel even offers an optional tablet that you can use to write on the screen electronically—perfect for all those budding Coach Maddens who long for a way to scribble over pass-pattern diagrams.

All in all, there is something here for nearly every taste, every budget, and every need. Keep in mind that we asked for only two panels from each vendor—usually the top and bottom models from their product lines. Many companies offer other models with different capabilities, something you may want to keep in mind if you don't see what you need right away. If you also need a projector, you may be interested in the companies that will sell you an LCD panel and overhead projector in a single package.

An LCD panel can make your desktop presentation that much more graceful, not to mention visible. Just pop your portable into its tote bag, grab some disks with your favorite graphics or slide-show software, pick up your panel, and head out the door. You're ready to take your show on the road!

APOLLO AUDIO VISUAL

PC Presenter PC9100GS

PC Presenter PC9603

by Winn L. Rosch

Although they both go by the name of PC Presenter, these LCD panels from Apollo Audio Visual are diverse creatures. At the low end, the \$895 PC9100GS warms up the dreariest graphics with its golden, low-resolution glow. With a maximum resolution of 640 by 480, the \$1,695 PC9603 lays out all the details in black and white.

At 2.5 inches thick, the PC Presenter PC9100GS is a modest performer rated for CGA resolution at 640 by 200 pixels, though it tips its hat at Apple II video as well.

Inside its soft plastic case, this low-end unit is a triple-decker air sandwich: heat-

absorbing glass below, protective glass above, and an LCD panel in the middle with thick air spaces as the meat in between. But despite the two continuously-running fans that blow a constant cooling breeze through the caverns, the PC9100GS showed the worst blooming of all tested LCD panels.

A series of .187-inch wide gashes on the right side allow cooling air to course inside. Dust will likely accompany the air, so be prepared to disassemble the unit occasionally to clean the interior LCD panel. A foam air filter would be welcome.

FAT GRAPHICS

The 8- by 5-inch clear viewing area (9.5 inches diagonally) veers substantially from the proper aspect ratio for good graphics, measuring 1.62 instead of the desirable 1.33. On the other hand, its supertwist LCD panel is clear and offers better contrast than its mediocre measurements on our benchmark tests might lead you to believe. This is perhaps because of its golden on-screen tone and moderate-to-good transmissivity. Slide the contrast control, and your screen changes from a pale yellow to a deep amber glow.

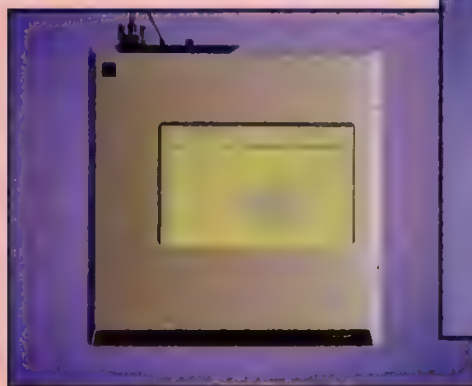
Unfortunately, black and yellow are the only on-screen color choices. The PC9100GS lacks gray-scale ability and copes with color via a single mapping control—an eight-position push button at the upper left corner. Each setting drops out a background color. Although this color mapping helps make most text readable, single letters, words, and paragraphs may disappear from screens with multiple character colors. This switch must also be used to simulate reverse video.

The panel's golden contrast is adjusted by a slider (not a very smooth one) on the front edge next to the power switch. On the rear panel are a video mode adjustment for composite signals and an unlabeled phase-adjust knob that operates as a multidetented switch. Next to these are the power and 9-pin D-shell video input jacks. The PC9100GS lacks image-positioning controls.

MULTIPLE ALLEGIANCES

A full 2 inches thick, the PC Presenter PC9603 is a two-layer sandwich. Its panel is mostly made from air with a wide cooling channel running between heat-absorbing glass on the bottom and a 10-inch (diagonal) LCD panel on top. Two fans send a continuous blast through the central air channel.

HARDWARE LCD PANELS



Apollo Audio Visual's low-end PC Presenter PC9100GS (left) warms up the dreariest graphics with its golden, CGA-resolution glow. With CGA, EGA, and VGA capability and a maximum resolution of 640 x 480, the PC Presenter PC9603 (right) lays out all the details in black and white.

The PC9603 is compatible with CGA, EGA, and VGA video as well as signals from Apple II and Macintosh computers. Standard equipment includes cables to connect only EGA and CGA video boards. A VGA cable is available as a \$59 option.

A black strip of plastic on the right side holds the PC9603's controls. All are membrane switches except for three small rotary controls that adjust the sensitivity of the panel to each primary color and

another rotary switch that selects an Apple operating mode. Besides the expected positioning, reverse video, and screen-clearing buttons, the PC9603 includes provisions for adjusting phase and frequency to better match the video system with which the panel is being used.

The optional \$129 infrared remote control has only six push buttons: clear screen, reverse video, and two each for altering contrast and color-mapping.

Two input connectors are available on the right—a 9-pin for digital standards and a 15-pin for VGA. The power switch and input for the external transformer are located here as well.



Apollo Audio Visual, 60 Trade Zone Ct.,
Ronkonkoma, NY 11779; (800) 777-3750,
(516) 467-8033.

PC Presenter PC9100GS

List Price: With IBM and Apple II cables, power supply, \$895; hard carrying case, \$167; soft carrying case, \$39.

Requires: CGA card or any Apple II video adapter, overhead projector.

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PC Presenter PC9603

List Price: With CGA, EGA, VGA and Apple II cables and power supply, \$1,695; IR remote control, \$129.95; Macintosh SE and Macintosh Plus cables, \$175 each; Macintosh II cable, \$367; hard carrying case, \$167; soft carrying case, \$39.

Requires: Any IBM color display adapter or any Apple II video adapter, overhead projector.

In Short: The PC9100GS is a thick CGA-quality LCD projector panel that provides golden yellow on-screen color but lacks gray-scale abilities. Its VGA-capable counterpart offers 640- by 480-pixel resolution, black-and-white images, and eight patterns to map colors and gray scales.

CIRCLE 397 ON READER SERVICE CARD

TRUE BLACK AND WHITE

The double supertwist LCD technology delivers a true black-and-white image. Although the panel cannot reproduce gray shades, you can assign up to eight dither patterns to represent various colors. The result is rarely satisfactory—continuous-tone portraits often sport Noriega-like blemishes—but it's probably better than nothing.

With 640 by 480 maximum resolution, the PC9603 can produce good monochrome (and monotone) VGA graphics. However, in text modes, the PC9603 slices off one pixel column from the left of each character.

The documentation supplied with both systems is adequate because the operation of each is so straightforward. By any objective standard, however, the scant pamphlets are deplorable. Both PC Presenters are covered by 90-day warranties.

The PC9100GS's golden contrast and

relatively low-price make it an attractive offer. The best reason for buying the PC9603, however, is its wide compatibility range—if you must support multiple equipment types and display standards, you may want to look more closely at this option.

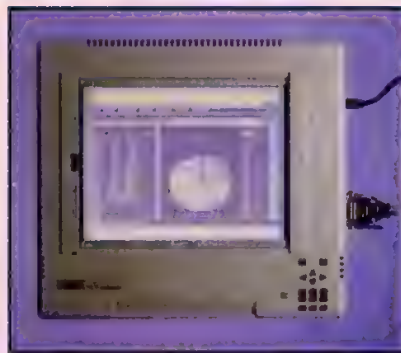
CHISHOLM

Looking Glass Light Writer 480LW

by Catherine D. Miller

A major OEM in the LCD panel arena for several years, Chisholm is now marketing products under its own label. The Looking Glass 200 series represents eight-color CGA resolution, while the 480 series can represent 16 colors at VGA or EGA resolution. In addition to the 480 series model reviewed here, models are available for

HARDWARE LCD PANELS



Chisholm's older 200 series represents only eight colors at CGA resolution, while the Looking Glass Light Writer 480LW can represent 16 colors at EGA or VGA resolution. Other models are available for the Macintosh, Macintosh II, IBM PC, and PS/2.

the Macintosh, Apple II, IBM PC (EGA resolution), and PS/2 lines.

The \$3,295 Looking Glass Light Writer 480LW includes the Looking Glass 480M LCD panel, an electronic Light Writer

tablet and pen, an infrared remote control, a power supply, protective attache case, and the Universal Prism; the latter allows simultaneous use of the LCD panel and a monitor. The Looking Glass 480LU is available without the Light Writer combination for \$2,295; and for \$1,895, you can purchase it with only a video cable, power supply, and remote control.

The Looking Glass LCD panel has a maximum VGA resolution of 640 by 480. But because of the system's Signature Recognition feature, which identifies the video signal, the panel can work with any PC graphics card or Macintosh computer.

High-contrast supertwist LCD technology uses blue pixels to display color information. Using a simulated color technique, shades range from yellow to magenta to blue in order to represent 16 IBM colors. The system thus maintains a color image's integrity without projecting true color.

The Touch Color feature gives added flexibility in presenting color combinations that might otherwise lose their informational value when projected. An electronic pointer lets you select a projected color representation and then choose one of 30 patterns or shades to replace it.

Although the panel's controls give you a great deal of authority over the appearance of an on-screen image, they are difficult to master. Not one is labeled by a function, so you will need a session with the manual in order to figure out how to use them. The custom setup and help

THE LITTLEST LCD PANEL

by Alfred Poor

Not all LCD panels designed for overhead projectors are built to connect to PCs—some have computers built right in. In addition, there's one that you can slip into your pocket.

It may be hard to believe, but the Casio FX-7000G/OHP is just such a machine. A \$79.95 calculator, it actually serves double duty as an LCD display panel for overhead projectors.

Like many standard calculators, the FX-7000G/OHP uses an LCD window to display results; it can show eight lines of 16 characters. It also comes complete with dedicated keys for a variety of mathematical functions (as do many other calculators), such as trigonometric calculations and regression analysis. And, like others of its ilk, it is even programmable.

Some calculators can display graphics and the FX-7000G/OHP is one of them. Enter an equation, punch a button, and you get a graph drawn in a 96-by-64-pixel display.

The FX-7000G/OHP, however, truly steps out of the crowd the moment you

lay it on an overhead projector; the projector light shines through a window in the back so that the image can be seen on the screen.

Admittedly, it would be tough to design a presentation that would come close to anything you might create with a laptop, a simple slide show program, and a full-size LCD panel. The FX-7000G/OHP was designed primarily for the schoolroom, aimed at science and math classes where the teacher wants to demonstrate calculations or graph results.

While it may be a far more informal presentation tool than a PC-based system, the FX-7000G/OHP can't be beat for portability and ease-of-use. It might be just the ticket for those departmental budget meetings, or for working out how to split the lunch bill so that everyone can see the numbers.

FX-7000G/OHP, Casio Inc., P.O. Box 7000, Dover, NJ 07801; (201) 361-5400. **List Price:** \$79.95. **Requires:** Overhead projector.

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FACT FILE

Looking Glass Light Writer 480LW

Chisholm, 910 Campisi Way, Campbell, CA 95008; (800) 888-4210, (408) 559-1111.

List Price: With Light Writer Tablet and Pen, IR remote control, power supply, lockable hard carrying case, Universal Prism, \$3,295; Model 480LU (includes everything in Model 480LW except Light Writer Tablet and Pen), \$2,295; Light Writer Tablet and Pen accessory, \$1,200; Light Writer mouse, \$150; 10-foot cables, \$99; video adapters for AT&T, Olivetti, or Macintosh, \$99; *Show Partner* software with 2-foot serial cable, \$125; International 220-volt power transformer, \$85.

Requires: CGA, EGA, VGA, MDA, MCGA, Hercules, Macintosh, or Macintosh II video adapter card; overhead projector.

In Short: With its remote control, adapter box, and the Light Writer electronic writing tablet, the Looking Glass Light Writer 480LW is a complete LCD projection panel presentation package. The Looking Glass LCD panel has VGA resolution, but the quality of the projected image suffers from relatively low contrast.

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WYSIWYP

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screens, however, are both easy to use.

The Looking Glass had a high bloom ratio and good transmissivity in comparison with the other tested LCD panels. Its greatest failing was its relatively poor contrast—one of the lowest tested. At review time, Chisholm was working on a new LCD panel, which the company claims will improve the contrast by 100 percent.

DISTINGUISHING FEATURE

Chisholm distinguishes its product with its Light Writer electronic tablet and pen; these fun-to-use components can be a useful addition to many presentations.

By using the Light Writer pen, you can select drawing choices from the electronic touch-pad. You can choose to draw free-hand with four-line thicknesses—one, two, four, or eight pixels—or draw a straight line with any of these thicknesses. You might draw with an asterisk, fill box, or a box outline, which allows the text within the box to show through. You can highlight, shade, or window the projected image you draw over. Images produced by either the computer or the Light Writer can be selected and stored, or removed from the projection screen. In addition, all the controls on the Looking Glass panel

All the Looking Glass panel's controls are also found on the Light Writer tablet, so you can orchestrate your entire presentation.

are found on the Light Writer, so you can easily orchestrate the entire presentation.

The system is available through dealers and VARs. Toll-free technical support and a one-year parts-and-labor warranty are standard.

The Looking Glass Light Writer 480LW is a competent combination of products, although the panel's relatively low contrast and confusing controls detract from its attractiveness. We're ea-

gerly awaiting the new panel, which should address these problems.

Despite the present drawbacks, however, the Light Writer is still a great way to annotate LCD panel presentations. A wonderful training or teaching tool, it also allows great freedom for business meetings and sales presentations in which ideas are being developed and refined.

COMPUTER ACCESSORIES/ PROXIMA

Proxima Data Display Multimode

by Winn L. Rosch

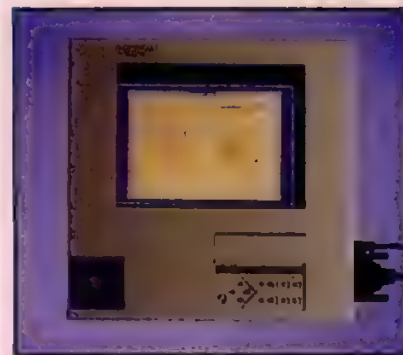
The \$2,199 Proxima Data Display Multimode from Computer Accessories/Proxima is the slimmest, lightest-weight panel available. The one-inch-thin system offers excellent color-mapping, exemplary ability to approximate continuous-tone images, and top resolution.

While the physical embodiment of the Multimode is a trim 12.5 by 12.5 by 1.12 inches (HWD), its compact size doesn't compromise the image area, lending a full 8.37 by 6.37 inches. The Multimode also has room for a temperature double-protection scheme—heat-absorbing glass and a continuously running internal fan for active cooling.

The Multimode packs more pixels than any other tablet, with a 720-pixel-wide by 480-pixel-high array (all are not normally active simultaneously). For VGA graphics, it activates a 640-by 480-pixel section of the screen. For dot-perfect VGA text, it controls a 720-by 400-pixel array. (You must press a control switch to toggle between pixel screen widths.)

In the latter mode, it eliminates the endemic problem of 640-pixel-wide displays, which uniformly ignore the first of nine columns of pixels for every character (typically the left-most), leaving them oddly shaped and skinny. In graphics mode, however, the aspect ratio is slightly off, yielding 480-dot-wide El Greco-style images—slightly over-square and discernably taller than they should be.

Beyond the VGA standard, the Multimode is adept at working with CGA, EGA, and monochrome (including Hercules) text and graphics generated by IBM



The Proxima Data Display Multimode from Computer Accessories/Proxima is the slimmest, lightest-weight panel available. The Multimode packs more pixels than any other tablet, an array 720 wide by 480 high (although all are not normally active at once).

and compatible computers. It also supports Macintosh, AT&T, and Olivetti video standards.

SMARTER THAN AVERAGE

The Multimode is smarter than the average LCD panel. Its built-in microprocessor automatically adjusts color assignments for the most legible image. It works wonders on graphics—scanned photographs with 256 colors at VGA resolution were sharply and distinctly rendered without dithering in the Multimode's 16-color (yellow-to-purple) spectrum. Text on the Multimode was consistently legible, though not quite so remarkable—careful



FACT FILE

Proxima Data Display Multimode

Computer Accessories/Proxima, 5610 Nancy Ridge Dr., San Diego, CA 92121; (800) 582-2580, (800) 582-0852 (only in Calif.), (619) 457-5500.

List Price: With IR remote control, interface cables for the IBM PS/2 and Macintosh II, *Presentation Partner* software, \$2,199; soft carrying case, \$79.95; Macintosh SE interface kit, \$149.95; Macintosh Plus 512K interface kit, \$149.95; EGA/CGA interface cable, \$79.95; AT&T 6300 or Olivetti interface cable, \$99.95; European power transformer, \$69.95; English power transformer, \$69.95; extra remote control, \$69.95.

Requires: IBM-standard video adapter; overhead projector.

In Short: The VGA-quality Multimode has remarkable continuous-tone rendering in 16 shades of yellow and purple, excellent VGA text with 720 by 400 resolution, full local and remote control, and a serial connection for controlling PC sequencing.

CIRCLE 399 ON READER SERVICE CARD

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XR-1000



NX-2410

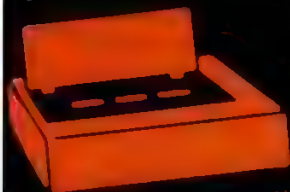


XB-2410

CIRCLE 348 ON READER SERVICE CARD



THE 386 SERIES



PRINTERS



MONITORS



MODEMS



LAP TOP



NETWORKING

THE

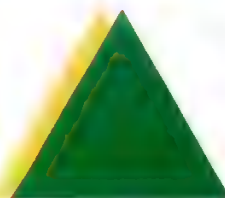
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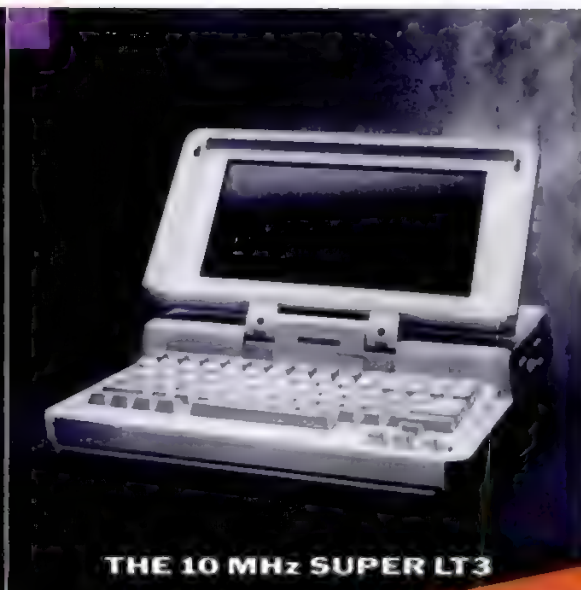
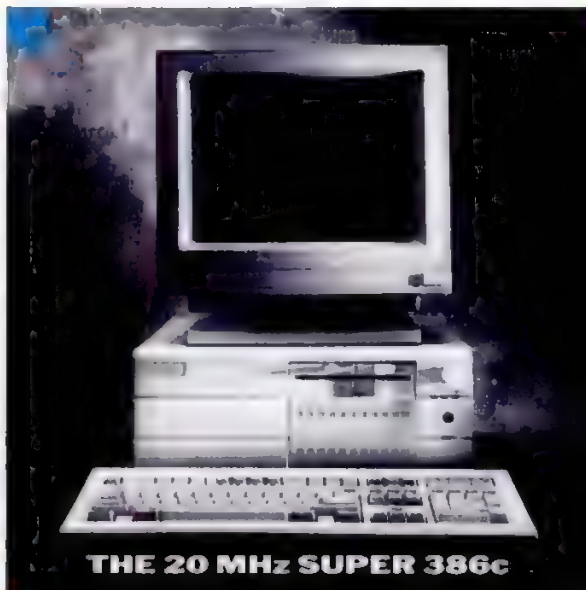
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CIRCLE 525 ON READER SERVICE CARD



LCD PROJECTION PANELS: SUMMARY OF FEATURES

Products listed in ascending price order

Dimensions of power supply All the units tested had external power supplies; these varied significantly in size.

Number of fans A steady air supply can help maintain relatively even temperatures across the LCD layer, which helps to minimize the blooming problems caused by heat. The downside of this feature is that panels with fans are likely to generate more noise, which is a potential obstacle during a presentation. All of the units tested had one or more internal fans running constantly, except the 480GS/2 PC Viewer, which had no fan at all.

LCD technology used Different panels use different types of LCD layers. The least expensive panels use supertwist technology,

which usually results in a single-color image on a single-color background (typically blue on yellow). Higher-priced models rely on more-advanced designs, such as the double supertwist, which produces a black-and-white image.

Number of gray shades Monochrome panels (those that produce only two colors) have two ways of representing different colors in an image. Some panels, as mentioned in the reviews, produce patterns of lines or dots in different densities to represent different colors. This, however, is not as attractive a solution as those that can actually display even shades of "gray." In general, more gray shades will result in a better representation of an image that was originally in color.

Maximum resolution Many of the panels tested could support more than one display mode. This item lists the maximum number of pixels that the panel is capable of displaying.

Rated pixel response speed This number represents the manufacturer's specification for how quickly a single pixel can be turned on or off. A shorter time usually indicates that the panel can update an image more quickly, so that there is less tendency to blur when the screen is changing rapidly.

25-pin serial connections Some panels have provisions that allow them to communicate with the computer through a serial port. This permits you to use special slide-show programs and to issue commands

	PC Presenter PC9100GS Apollo Audio Visual \$895	MagniView 200 Dukane Corp. \$1,095	Magnabyte 5040 Telex Communications Inc. \$1,350	Sharp QA-50 Sharp Electronics Corp. \$1,395	Magnabyte 5080-120 Telex Communications Inc. \$1,620	PC Presenter PC9603 Apollo Audio Visual \$1,695
GENERAL FEATURES						
Dimensions (HWD, in inches)	13 x 12.75 x 2.5	12.5 x 12 x 1.1	11.65 x 13 x 2	12.4 x 14.1 x 2	11.65 x 13 x 2	14 x 12.25 x 2
Weight (pounds, including power supply)	5.5	4	5.9	7.7	6.6	5
Power supply rating	1 amp	9 watts	20 watts	27 watts	19.5 watts	1 amp
Dimensions of power supply (HWD, in inches)	2.75 x 2.5 x 2	2 x 2 x 1.5	2 x 2.5 x 1.8	2.4 x 3.25 x 2.1	3 x 2.6 x 2.3	2.75 x 2.5 x 2
Number of fans	2	1	1	1	1	2
VIDEO FEATURES						
LCD technology used	Supertwist	Supertwist	High-contrast supertwist	Double supertwist	High-contrast supertwist	Double supertwist
Number of colors available	2	2	2	2	2	2
Number of gray shades (for monochrome panels)	2	8	8	2	8	2
Maximum resolution (pixels)	640 x 200	640 x 200	640 x 200	640 x 480	640 x 480	640 x 480
Rated pixel response speed (ms.)	150	350	200	200	200	150
Display modes supported :						
Hercules	☐	☐	☐	☐	☒	☐
CGA	☒	☒	☒	☒	☒	☒
EGA	☐	☐	☐	☒	☒	☒
VGA	☐	☐	☐	☒	☒	☒
Other	Apple	Apple	None	Apple, Macintosh, MCGA	Macintosh	Apple, Macintosh

☒—Editor's Choice ☒—Yes ☐—No

N/A*—Not applicable: the 480C PC Viewer is not a monochrome panel.

with a remote control that will be passed on to the computer. (None of the tested panels use 9-pin connections.)

Dual signal Most of these products offer a Y cable that permits both computer and monitor to be connected directly to the computer end of the cable.

A **pass-through video signal** permits a different configuration, in which a monitor is attached to the panel, which in turn is linked to the computer. The panel projects the signal and passes it simultaneously to the monitor. In some cases, this can be a significant advantage, because it allows placing the monitor near the overhead projector rather than close to the computer.

Horizontal and vertical positions These two controls are often required to center the computer image on the projector panel.

Reverse This control allows you to reverse the foreground and background colors, choosing between light letters on a dark background and dark letters on a light background.

Blank screen This is a handy control; it allows you to blank the panel screen without altering the image coming from the computer. In practice, this means that you can temporarily remove the projected image so that your audience is not distracted by it while you make your remarks. Press the control again and the image is restored.

adjustment of the color and contrast controls was necessary to get more than four or five distinct shades on-screen at once.

Visible controls include a diamond of four buttons that change image position; color and contrast are raised and lowered by individual buttons. Others include text mode, reverse video, sync adjustment, and screen clearing. Only the fine-sync knob is hidden behind a hinged panel.

A standard remote control duplicates these functions and includes additional buttons for sequencing. Commands are sent from the Multimode to your computer through an RJ-11-based serial connection. Adapters are included to mate with 9- or 25-pin PC serial connectors.

While the Multimode appears to connect with a simple Y cable, signals actually loop through the panel, which must be on if you want to see an image on your computer display. It must also be on when you boot up, or your system won't know whether it's connected to a color or monochrome VGA display.

The Multimode is identical to the MagniView 480 sold by Dukane Corp. with one minor difference—the Proxima panel is pale beige while the Dukane is battleship gray. Both panels include the same one-year warranty.

Computer Accessories/Proxima also sells the Proxima Data Display 200 and 400 panels. The Proxima 200 is only CGA compatible (see the review of Dukane's nearly identical MagniView 200), and the Proxima 400 is compatible with both CGA and EGA video modes.

Although the Multimode was no star in PC Labs' benchmark tests, it nevertheless shines for its perfect VGA text and its exemplary continuous-tone rendering. This model—or its Dukane doppelganger—is your top choice if you need to display scanned halftones or gray-scale graphics.

Kodak Datashow 480 Eastman Kodak Co. \$1,895 (plus \$129 IBM interface)	 ViewFrame II + 2 nVIEW Corp. \$1,995	Proxima Data Display Multimode Computer Accessories/ Proxima \$2,199	480GS/2 PC Viewer In Focus Systems Inc. \$2,995	Looking Glass Light Writer 480LW Chisholm \$3,295	480C PC Viewer In Focus Systems Inc. \$4,995
14.25 x 14 x 3	11.25 x 14.75 x 1.6	12.5 x 12 x 1.1	11.7 x 12.6 x 2.2	11.65 x 13 x 2	14.25 x 13.25 x 3
9.1	5.7	4	6.6	10.6	9.5
50 watts	25 watts	20 watts	.75 amps	19.5 watts	1 amp
3.4 x 2.6 x 2.1	2.5 x 2.4 x 2	3 x 2 x 2	2 x 2.1 x 1.75	3 x 2.6 x 2.3	3.15 x 2.5 x 2.25
2	1	1	None	1	1
Double supertwist high-contrast	Double supertwist nematic	Supertwist with colorized filters	Double supertwist nematic	High-contrast supertwist	Triple supertwist nematic
2	2	2	2	2	8
8	8	2	8	8	N/A*
640 x 480 280	640 x 480 200	720 x 480 180	640 x 480 250	640 x 480 200	640 x 480 250
■ ■ ■ ■	■ ■ ■ ■	■ ■ ■ ■	□ ■ ■ ■	■ ■ ■ ■	□ ■ ■ ■
Apple, AT&T/ Olivetti, Macintosh, MCGA, MDA	Apple, Atari, AT&T/Olivetti, DEC, Macintosh, MCGA	AT&T/Olivetti, Macintosh	Apple, Macintosh, MCGA	AT&T/Olivetti, Macintosh	AT&T 6300, HGC, Macintosh, MCGA

DUKANE CORP. MagniView 200

by Winn L. Rosch

The MagniView 200 from Dukane Corp. is one of the lower-priced systems (not the lowest) reviewed here. Dukane puts a \$1,095 price tag on the panel, which is a remarkable feat considering that its identical twin, the Proxima Data Display 200, is sold by Computer Accessories/

CONTINUES



LCD PROJECTION PANELS: SUMMARY OF FEATURES

	PC Presenter PC9100GS Apollo Audio Visual	MagniView 200 Dukane Corp.	Magnabyte 5040 Telex Communications Inc.	Sharp QA-50 Sharp Electronics Corp.	Magnabyte 5080-120 Telex Communications Inc.	PC Presenter PC9603 Apollo Audio Visual
INPUT/OUTPUT CONNECTIONS						
Power	■	■	■	■	■	■
25-pin serial	□	□	□	□	□	□
Analog video	□	□	□	■	■	■
Dual signal	N/A*	N/A*	N/A*	□	□	□
Composite video	■ (Apple only)	■	□	□	□	□
Dual signal	□	□	N/A*	N/A*	N/A*	N/A*
Digital video	■	■	■	■	■	■
Dual signal	□	□	□	□	□	□
Pass-through video signal	□	□	□	□	□	□
Keyboard input	□	□	□	□	□	□
Other	None	None	None	None	None	None
CONTROLS (ON UNIT OR REMOTE)						
Contrast	■ (on unit)	■ (on unit)	■ (on unit)	■ (both)	■ (on unit)	■ (both)
Horizontal and vertical positions	□	■ (on unit)	■ (on unit)	■ (on unit)	■ (on unit)	■ (on unit)
Color	□	□	■ (on unit)	□	■ (on unit)	■ (on unit)
Reverse	□	■ (on unit)	■ (on unit)	■ (both)	■ (on unit)	□
Text color	■ (on unit)	■ (on unit)	■ (on unit)	□	■ (on unit)	□
Focus	□	□	■ (on unit)	□	■ (on unit)	■ (remote)
Power	■ (on unit)	■ (on unit)	□	■ (on unit)	□	□
Blank screen	□	□	■ (on unit)	■ (both)	■ (on unit)	■ (remote)
Other on-unit controls	Phase adjust, video mode	Sync	None	Frequency, phase, reset, RGB levels, shade	Custom setup, freeze, help screen, electronic pointer, touch color	Shade
Other remote controls	None	None	None	RGB, shade	None	Apple/ Macintosh modes, frequency, phase, reset, RGB, shade

■—Editor's Choice ■—Yes □—No

N/A*—Not applicable: this product does not support the video mode in question.



The MagniView 200 from Dukane Corp. is one of the lower-priced systems (though not the very lowest) reviewed here. This CGA panel and its images are tinged blue, with a maximum of eight different shades.

Proxima—the company that manufactures the panel for Dukane—for \$1,199.

The on-screen resolution of the Data Display 200 is the 640- by 200-pixel standard of IBM's CGA adapter. The panel itself and its images are tinged a rhapsodic blue, with a potential for distinguishing, at best, eight shades.

If that's all you aspire to, you'll find the MagniView 200 adequate. The details are right—it's easy to set up and it has a near-perfect aspect ratio on its 8.37- by 6.37-

HARDWARE

LCD PANELS

Kodak Datashow 480 Eastman Kodak Co.	ViewFrame II + 2 nVIEW Corp.	Proxima Data Display Multimode Computer Accessories/ Proxima	480GS/2 PC Viewer In Focus Systems Inc.	Looking Glass Light Writer 480LW Chisholm	480C PC Viewer In Focus Systems Inc.
■	■	■	■	■	■
□	□	□	□	■	□
■	■	■	■	■	■
■	■	□	□	■	□
■	□	□	■	□	□
■	N/A*	N/A*	■	N/A*	N/A*
■	■	□	■	■	■
■	■	N/A*	□	■	□
□	□	■	□	■	□
□	□	□	□	■	□
Output box	Y cables for CGA/EGA, VGA, Macintosh II	RJ-11 serial connection	None	None	None
■ (on unit)	■ (on unit)	■ (both)	■ (both)	■ (both)	■ (on unit)
■ (on unit)	■ (on unit)	■ (both)	■ (on unit)	■ (both)	■ (on unit)
□	□	■ (both)	■ (on unit)	■ (both)	■ (on unit)
■ (on unit)	■ (on unit)	■ (both)	■ (both)	■ (both)	■ (on unit)
□	□	□	■ (on unit)	■ (both)	□
□	■ (on unit)	□	■ (on unit)	■ (both)	■ (on unit)
■ (on unit)	□	■ (on unit)	□	□	□
□	□	■ (on unit)	□	■ (both)	□
Analog color level, palette via setup button, reset, save, stability	Palette (gray scale or pixel pattern), RGB levels	Sync, 720/640 column mode	Reset, store adjustments, tracking	Custom setup, electronic pointer, freeze, help screen, touch color	Reset mode, tracking
Same as on-unit controls	None	Exit for use with Presentation Partner, forward, reverse	Memory module, screen control	Same as on-unit controls	None

Hidden behind a hinged door is a color deselector, designed to make text against a colored background as legible as possible. Rotating this control drops out one color at a time—typically the background.

Besides its standard 9-pin TTL RGB input (compatible with most CGA and EGA adapters operating in CGA mode), an RCA jack is available for composite video signals from Apple II computers. The CGA cable is electrically split into

Dukane's MagniView 200 is commendable particularly because of its compact size and low cost.

a Y configuration so that both the MagniView 200 and a computer monitor can be connected to a single video board at the same time. For power, the MagniView 200 requires a small 9-watt external transformer.

Both Dukane and Computer Accessories/Proxima pack Brightbill-Roberts' Presentation Manager slide-show software with their products, along with a one-year warranty. Both companies also offer higher-resolution displays (see our review of the Computer Accessories/Proxima Data Display Multimode).

The Dukane MagniView 200 is commendable particularly because of its compact size and low cost. It also benefits

ENDS

inch screen. Moreover, the MagniView 200, packaged in battleship-gray plastic, is stylish and compact at 12 by 12.5 by 1.25 inches (HWD). (The Proxima version differs only in that it is encased in pale beige plastic.)

A single fan inside the trim package supplements the heat-absorbing glass below the MagniView 200's LCD screen. Even with this double-barreled protection, however, the MagniView was plagued by image blooming.

CONTROLLING THE SYSTEM

Three slide switches on the panel control the power, reverse video mode, and minor sync signal adjustments. A matching slider adjusts contrast.

To move the entire on-screen image area, the MagniView 200 provides four-stepped rotary controls, two each for horizontal and vertical motion. A coarse control moves the image one column or row at a time and a fine control moves it one pixel at a time.



FACT FILE

MagniView 200

Dukane Corp., 2900 Dukane Dr., St. Charles, IL 60174; (708) 584-2300.

List Price: With Presentation Partner software, IBM and Apple II cables, power transformer, \$1,095; soft carrying case, \$100; composite Y cable, \$80; European transformer, \$26; English transformer, \$40; RGB Y cable, \$80.

Requires: CGA video adapter; overhead projector.

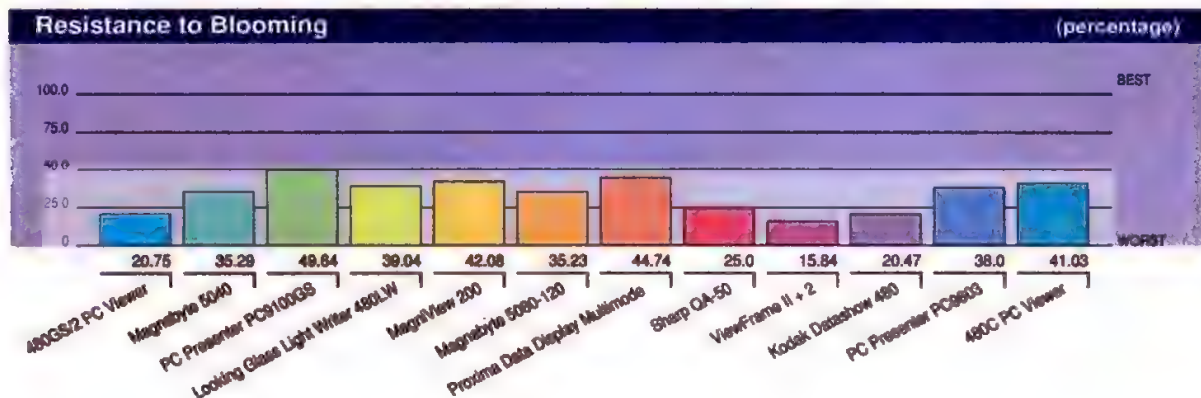
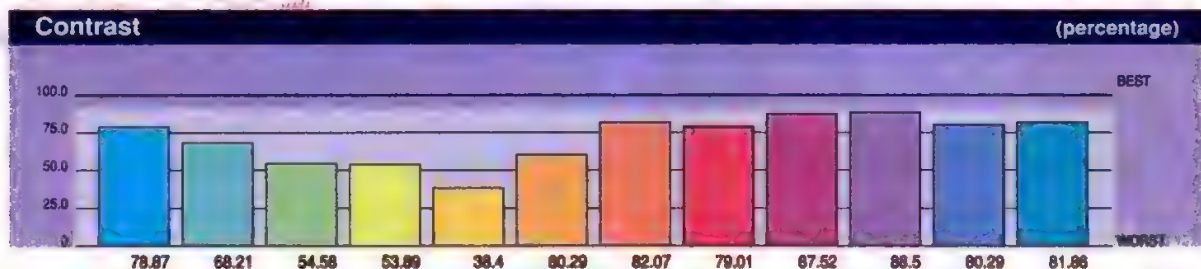
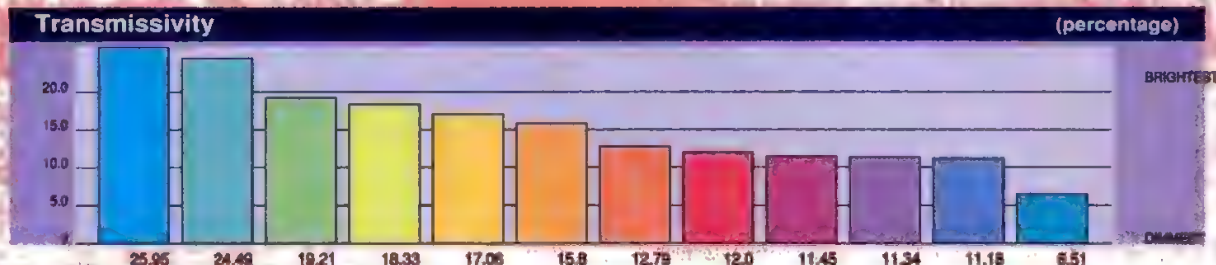
In Short: The MagniView 200 is an unremarkable thin LCD projector panel with CGA resolution, low contrast, and images made from eight shades of blue.

CIRCLE 400 ON READER SERVICE CARD



PERFORMANCE TESTS: LCD PROJECTION PANELS

LCD panels with the latest design are not as bright but offer higher resolution and better contrast than their predecessors did. The best of the new breed, nVIEW Corp.'s ViewFrame II + 2, displays crisp VGA imaging in black and white. Its superior performance is due in large part to its double-supertwist nematic LCD, which makes possible a high-contrast image.



To minimize subjective variations, all panels were tested under identical conditions by the same person.

The tests were carried out using an IBM PC AT operating at 8 MHz. The panels were tested at the highest resolutions they supported; either an IBM CGA or an IBM VGA card was used in each case.

For the Transmissivity, Contrast, and Aspect Ratio measurements, the panels were placed on a 3M 920 overhead projector. This model has a relatively cool projection stage, which should reduce heat-related problems for LCD panels. For the Resistance to Blooming test, an older-design projector from a different vendor was used to produce less than optimal conditions. A voltage controller was used with both projectors to keep the power constant, reducing variations in light levels.

The images were adjusted to fill a 6-foot-wide space; each image was projected onto a large sheet of white paper that had vertical guidelines drawn 6 feet apart and a horizontal top line. The panel was positioned so that the center of the projector's Fresnel lens was centered on the target screen.

All measurements were made using a light meter in a darkened room to minimize ambient light.

Before the first set of measurements, the LCD panels were adjusted to produce the best apparent contrast for text.

Transmissivity is a measure of the amount of light that will pass through an LCD panel. To test it, we placed a light meter at the center of the projection screen; we then took readings while the overhead unit projected light first through the LCD panel and then with the panel removed. The first reading was converted to a percentage of the second reading to produce the transmissivity measure. A higher number indicates a brighter image.

Our **Contrast** test measures the difference between the dark and light portions of an image by taking light-meter readings from five points on the projection screen: the center and four corner points set 6 inches from the edges. These five points were measured first with a clear image and then with a solid black image displayed on the panel.

Each set of five readings was averaged, the dark score subtracted from the light score, and the difference expressed as a percentage of the light score. A higher number represents a higher-contrast image.

Resistance to Blooming—image distortion caused by heat—was measured by placing a panel on the older projector and letting it run for 15 minutes so that the temperature could stabilize. The contrast was adjusted to achieve the most legible text image. A black image was then projected, and a light meter was used to find the minimum and maximum readings. The test measurement is the minimum reading expressed as a percentage of the maximum. A higher number represents a more consistent light level across the whole image, indicating a lesser heat effect on the panel—less blooming—and a better-quality picture.

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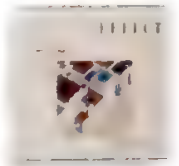
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Accounts Payable



Payroll



General Ledger



Job Estimating



Electronic Mail



Job Costing



Problem Tracking



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Medical



Chiropractic



Orthopedic

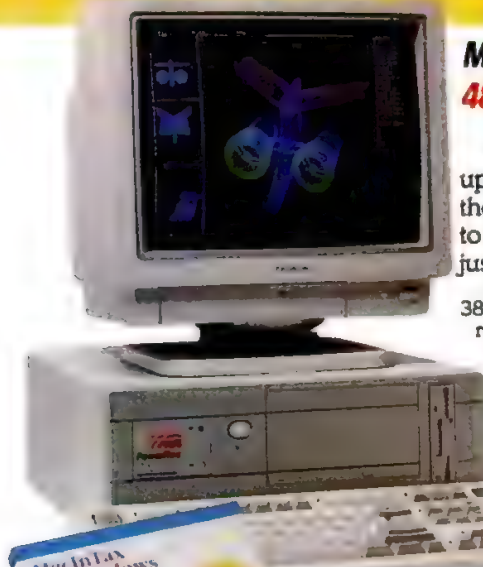


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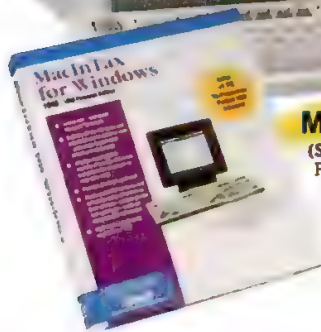
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MacInTax for Windows

(Softview)

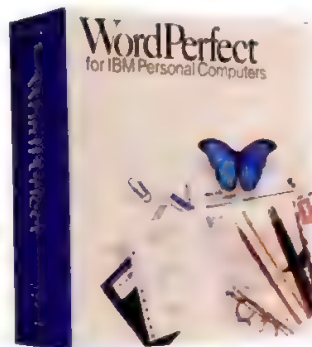
Prepare your taxes easily and accurately with Softview's MacInTax for Windows. Enter data directly into IRS forms, link data between forms, track the status of your return and print replicas of IRS forms ready for your signature. **\$67.**



WordPerfect 5.1

(WordPerfect)

WordPerfect's long-awaited version 5.1 comes complete with new innovative features to offer you greater flexibility. Bold, new features include pull-down menus, mouse support, tables, an equation editor and extensive graphic printing support. **\$245.**



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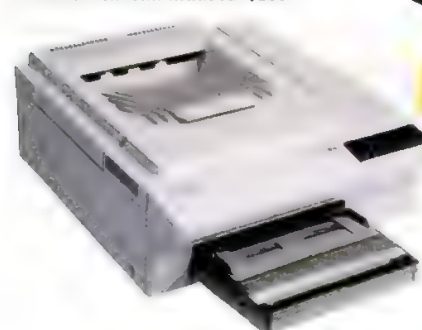
Process your paperwork quickly with a program that allows you to create and fill out forms in your PC rather than by hand. Fill out professional forms tailored to your specific needs then sort the data for future use. **\$83.**



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(Borland International)

Critically acclaimed Quattro Pro combines advanced spreadsheet publishing with multi-page consolidation. Link spreadsheets, graphs and databases and express your spreadsheet in ten types of graphs utilizing any or all of the nine Bistream fonts included. **\$269**



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SupraModem 2400 Ext.	115.
U.S. Robotics	
Courier HST 9600 w/Mnp	685.

INPUT DEVICES

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Expert Mouse PS/2	115.
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Series 9 Mouse (b/s/PS2)	75.
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Summasketch Plus	359.
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ArtRight Images Vol. 2	110.
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Omnipage 2.0 386	595.
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CIRCLE 224 ON READER SERVICE CARD



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Leather Case**

(Targus)
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ArtRight Images Vol. 1 & 2

(ArtRight) ArtRight brings the users of CorelDRAW! high definition images created with the pagelayout artist, manual writer and DTP user in mind. All of the high-quality images can be manipulated, skewed and filled with colors. **\$110 ea.**



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(Corel Systems) This powerful yet easy-to-use illustration package features lightning speed, over fifty precision fonts of any size, interactive kerning, bitmap support, excellent import/export support, clip art, macros and much more! **\$315.**



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Norton Util. Advanced 4.5	80
Norton Commander 3.0	82
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Softshell Systems Inc.	
Softbreeze 3.0	79.
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Softsafe	49
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Prof. Write 2.1 w/First Graph	143.
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Timeslips Corp.	
Timeslips III 3.4	159.
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Inbox 3.0 (20-user)	199
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Laplink III	79
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PlanPerfect 5.0	239
WordPerfect 5.1	245
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XTree Company	
XTree Pro Gold	72
XTree Pro	63

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CONTEST RULES 1. Entries for the Micro Warehouse 1990 Computer Giveaway must be received on or before 6/30/90 2. Winner selected in random drawing by attorneys for Micro Warehouse Inc., (MWH) whose decisions are final 3. Compaq Deskpro 486/25 subject to availability MWH reserves the right to substitute wholesale cash value up to \$6,000 4. Winner responsible for taxes. 5. Odds of winning depend on number of entries 6. MWH will announce the winner on or around 7/31/90 Winner will be notified by mail Dates subject to change at the discretion of MWH If unable to contact any winner, an alternate will be selected by random drawing 7. Contest is open to US residents, except where prohibited by law Employees of MWH and suppliers not eligible 8. Prize - one Compaq Deskpro 486/25 computer

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Ad Lib Music Card	163.
Broderbund	
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New Printshop Companion	32.
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David Wolfe: Secret Agent	29.
Gamestar	
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Teacher in a Box	
Teacher in a Box-WordPrct 5.0	62.
Teacher in a Box-Lotus 3.0 L.1	62.

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Turbo Tax Pro Series/1040 5.0	221.
Turbo Tax Personal	43.
Meca	
Tax Cut	45.
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TimeWorks	
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CAD SOFTWARE

American Small Business Co.	
Design CAD 3D 2.1	205.
Drafix	
Windows CAD	429.
Generic Software	
Basic Home Design	29.
Generic CAD 3D Drafting	132.
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MathCAD 2.5	285.

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Turbo Assembler/Debugger 1.0	95.
Turbo C Prof	159
Turbo Pascal Prof	159.
Microsoft	
Basic Compiler 6.0	184.
C Compiler 5.1	273.
Quick Basic 4.5	62.
Quick C 2.0	63.
Peter Norton	
Norton Editor 1.3	40

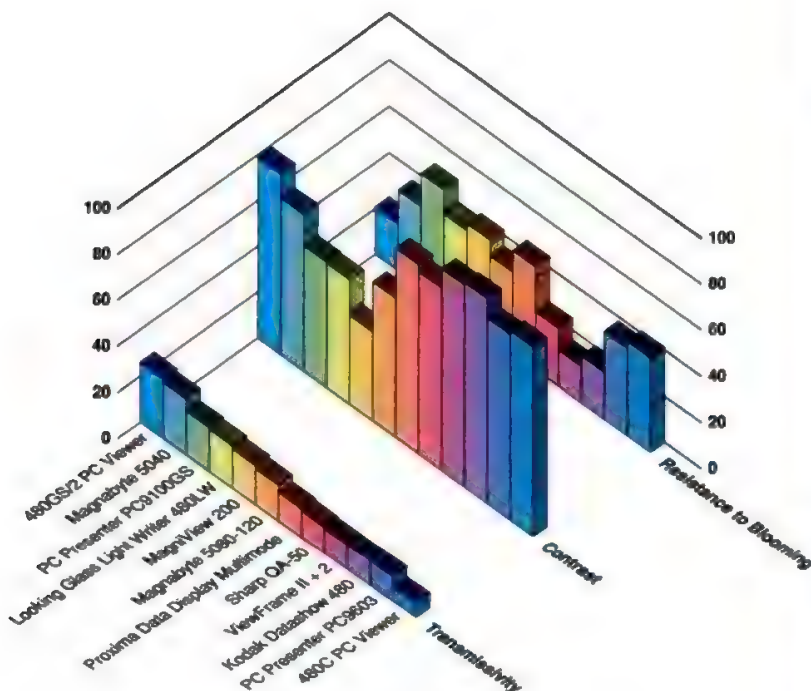


PERFORMANCE TESTS: COMPOSITE VIEW

Our tests show that LCD projection panels vary greatly in some significant performance areas, and some of these results are influenced by important subjective factors.

Aside from the Aspect Ratio, the measurements reported here depend on how the contrast settings for each panel are adjusted. Because of this subjective element, the results must be viewed liberally. Two panels with performance figures as much as 20 percent apart might produce images of comparable quality. Panels that are identical twins, but marketed by different vendors, sometimes produced quite different results.

Thus, while there are some significant differences across the field, there is relatively little difference between LCD panels with neighboring results. As a rule, panels with higher contrast tend to have lower transmissivity measures. These panels typically featured the best images (as well as the highest prices).



(Taller bars represent better performance)

THE WELL-PROPORTIONED IMAGE: TESTING THE ASPECT RATIO OF LCD PANELS

Each LCD's aspect ratio was measured by displaying a series of concentric circles on the screen in CGA mode and adjusting their proportions until the horizontal and vertical dimensions became the same. (The images are part of the PC Labs Benchmark Series, Release 4.2.) The ratio of width to height was then obtained directly from the screen.

The standard aspect ratio for a PC monitor is 1.33 to 1; the more the aspect ratio varies from this spec, the more distorted the graphics on the screen. Note that panels with a different ratio may still produce undistorted results with VGA graphics, but since most laptops produce CGA output, we tested using this mode.

Magnabyte 5040 (standard aspect ratio)	1.33
MagniView 200 (standard aspect ratio)	1.33
Looking Glass Light Writer 480LW	1.54
Magnabyte 5080-120	1.54
PC Presenter PC9603	1.54
Proxima Data Display Multimode	1.54
Sharp QA-50	1.54
480C PC Viewer	1.62
480GS/2 PC Viewer	1.62
Kodak Datashow 480	1.62
PC Presenter PC9100GS	1.62
ViewFrame II + 2	1.62

from Dukane's 40 years of experience in the audiovisual field. If you're looking for a low-end system, this may be a good choice. But if you need greater resolution or other high-end features, look elsewhere.

**EASTMAN KODAK CO./SAYETT
TECHNOLOGY DIVISION**

Kodak Datashow 480

by Henry Fersko-Weiss

The Kodak Datashow 480 offers some welcome features, including an on-screen setup routine that makes it easy to adjust image quality and the ability to remember settings for three video standards. The system is compatible with a variety of video signals, including CGA, EGA, VGA, MCGA, and Hercules modes.

The unit, however, comes without any extras; \$1,895 buys you only the panel itself and the power supply. That price doesn't even include the absolutely essential interface cable, which must be purchased for an additional \$129.

BUFFERED OUTPUT BOX

The interface cable has a buffered output box that lets you use a monitor with the panel. The box and cable add some weight to what is already a comparatively heavy unit: the panel and the power supply together weigh just over 9 pounds. With the interface, the weight increases to 10.5 pounds.



FACT FILE

Kodak Datashow 480

Eastman Kodak Co./Sayett Technology Division, 100 Kings Hwy., Rochester, NY 14617; (716) 342-0700.

List Price: With power supply, \$1,895; IBM interface, \$129; Apple Macintosh interface, \$129; AT&T and Olivetti interface, \$129; Macintosh SE or SE/30 HR/M video adapter, \$99; soft carrying case, \$110; IR remote system, \$250; *Smart Remote*, \$325.

Requires: IBM, Macintosh, Apple II, AT&T, or Olivetti graphics adapter; overhead projector.

In Short: The Kodak Datashow 480 uses an eight-shade gray scale to represent colors. But two of the grays are hard, if not impossible, to distinguish from a couple of other shades. The image contrast is excellent. A built-in setup routine lets you make image adjustments for up to three adapters at a time. The panel is a bit bulky and comes without extras.

CIRCLE 401 ON READER SERVICE CARD

HARDWARE LCD PANELS



The Kodak Datashow 480 is compatible with a variety of video signals, including CGA, EGA, VGA, and MCGA. Images are pretty good, with sharply focused text and graphics. The contrast tested slightly better than the others we reviewed.

The Datashow 480 is simple to set up. A built-in test pattern in black and white lets you set the contrast before you connect the panel to your computer.

When everything is connected, you can adjust the image quality with an on-screen setup routine using the soft arrow buttons on the top of the panel. The routine lets you regulate the analog color level, as well as image stability and position. It also lets you choose gray-scale or monochrome operation, and the gray-scale palette.

The machine will retain in memory three setups—each for a different video standard—and recall the appropriate one to match the computer you're using.

Images from the Datashow 480 are pretty good, with text and graphics in sharp focus across the display. The contrast is excellent. In fact, by a slim margin the contrast of this panel tested better than all the others we reviewed.

The quality of the image, however, suffers a bit in other ways. For one thing, the gray scale didn't achieve eight truly distinct shades. No matter how the settings were changed, it was impossible to see the difference between two of the shades, and two others were so close that they couldn't be easily separated.

Additionally, the Datashow 480 has low transmissivity and faint ghost images are visible in a few places; in other areas, a slight shimmering appears. There is also a small amount of blooming despite the two cooling fans.

One other difficulty with the panel is

the especially wide border of the housing around the LCD screen, which makes it very hard to center the panel on the projector. In order to see the whole image with a Bell & Howell projector, I had to turn the panel askew to avoid the pole holding the optics. To get the image straight on the projector screen, I had to tilt the projector to the side at a precarious angle.

The Datashow 480 is a good but not great system. Its superior image contrast is not matched by other visual aspects. Additionally, it suffers from being tricky to set on the projector, and is priced at the upper end of the spectrum.

IN FOCUS SYSTEMS INC.

480C PC Viewer 480GS/2 PC Viewer

by Catherine D. Miller

In Focus Systems offers a complete line of LCD projection panels, including the \$4,995 480C PC Viewer, the first panel to display eight true colors rather than represent colors as shades. The company also manufactures the \$2,995 480GS/2 PC Viewer, the only panel we reviewed that includes a memory module that stores up to 70 EGA or 50 VGA screens.

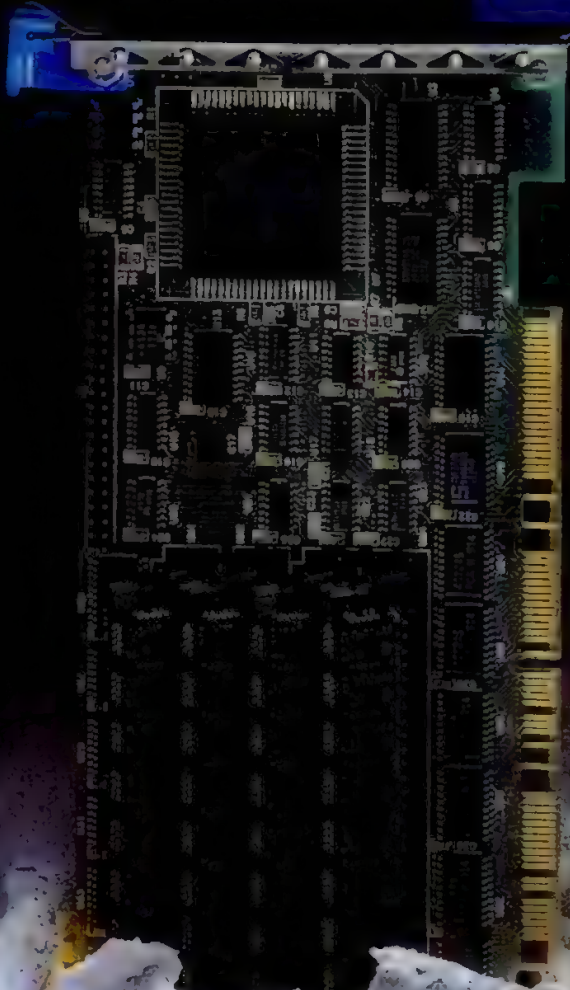
The 480 PC Viewer series products boast 640-by-480-resolution. Other products in the series (not reviewed here) include the 480S/2 PC Viewer, which also provides a memory module that stores software images, and the 480GS and 480S, which display eight shades or eight patterns with black-and-white or blue-and-yellow images, respectively. The 200S PC Viewer projects blue-and-yellow images in CGA resolution, using eight shades or eight patterns to represent various colors.

IMAGES IN LIVING COLOR

After seeing color represented by shades and patterns, we were excited to see the true color displayed by the 480C PC Viewer. Black, blue, green, cyan, red, magenta, yellow, and white are rich and vibrant, faithfully projected from computer software to the projection screen. (The remaining eight colors of the default IBM 16-color palette are assigned to the closest match.)

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We develop products on the premise that



Page Laser12: 12 ppm, up to 3 paper bins, 750 sheet capability, Toshiba/Qume, Diablo, IBM & HP emulations.



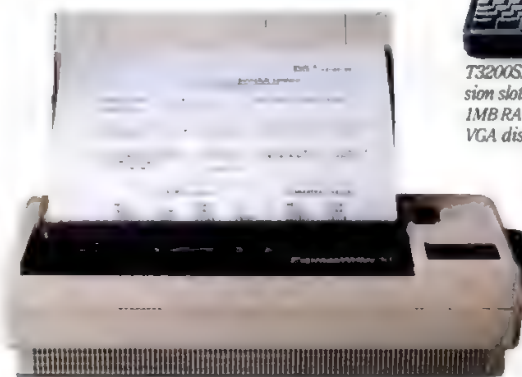
T1000: 6.4 lbs, 4.77MHz 80C88, 512KB RAM expandable to 12MB. MS-DOS in ROM, 720KB 3½" diskette drive. Built-in RGB, parallel, serial and external drive ports.



P341SL: Wide carriage (up to 270CPL), 216/72 cps, advanced paper handling, 4 part forms.



T3200SX: 170 lbs., 16MHz 386SX, 6 expansion slots, 5 built-in ports, 40MB hard disk, 1MB RAM expandable to 13MB, gas plasma VGA display, 1.44MB 3½" diskette drive.



ExpressWriter 301: 4 lbs, letter-quality 24-dot print head, 60 cps, Toshiba/Qume and Epson LQ emulations, 5 resident fonts.



T3100e: 12MHz 80286, internal IBM slot, 40MB hard disk, gas plasma display, 1MB RAM expands to 5MB, 1.44MB 3½" diskette drive.

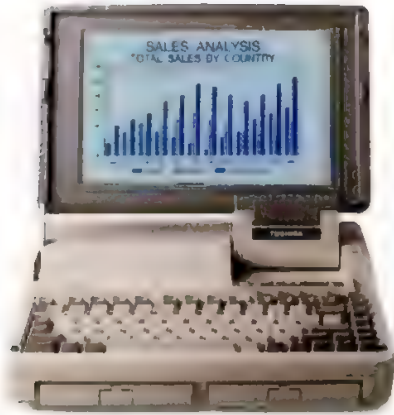


T5100: 16MHz 80386 microprocessor, 100MB hard disk, 2MB RAM expandable to 4MB 14.6 lbs. Built-in EGA display with high resolution gas plasma screen.



P35ISX: 360/120 cps, 24-pin letter quality, color option, Toshiba/Qume and IBM emulations standard, Epson & Diablo emulations optional.

great minds don't think alike.



T1600: 11.6 lbs. Battery-powered 12MHz 286, 20MB or 40MB hard disk, 1.44MB floppy, 1MB RAM expands to 5MB, backlit EGA LCD, removable/rechargeable battery packs.



TS200: 20MHz 80386 processor, 2 internal IBM compatible expansion slots, 40 or 100MB hard disk, VGA display with external VGA monitor port, 2MB RAM expandable to 8MB.



T3200: 12MHz 286, 2 IBM compatible slots, 40MB hard disk, 1.44MB floppy, 1MB RAM expands to 4MB, EGA screen.



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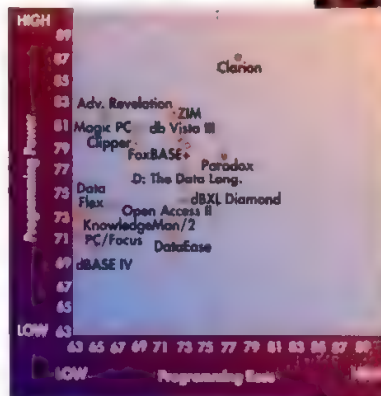
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To create color, the 480C PC Viewer depends on a subtractive color process, which starts with white pixels. By withdrawing any or all primary colors from the white pixel, the pixel can become any one of eight colors. This proprietary method of producing on-screen color is based on triple supertwist nematic (TSTN) LCD technology.

If you decide you'd rather have green represented by red, or black represented by magenta, you can choose one of seven alternative color palettes. You might find that a different palette will offer greater color contrast for some software images.

When we initially hooked it up, the 480C produced a lot of ghosting and shimmering, with unevenly-weighted text. By fiddling with the sync, contrast, and tracking controls, the panel finally projected a sharp picture only slightly marred by vertical ghosting and shimmering. Three knobs for red, yellow, and blue on the side of the panel also helped ease ghosting and color saturation problems.

We were unable, however, to get the



FACT FILE

In Focus Systems Inc., 7649 SW Mohawk St., Tualatin, OR 97062; (800) 327-7231, (503) 692-4968.

480C PC Viewer

List Price: With cables and power supply, \$4,995; soft carrying case, \$129.95; International transformers available from distributors.

Requires: CGA, EGA, or VGA graphics adapter; overhead projector.

CIRCLE 402 ON READER SERVICE CARD

480GS/2 PC Viewer

List Price: With cables, power supply, IR remote control, memory module, \$2,995; Model 480GS (same as above, but without remote or memory module) \$1,655; soft carrying case, \$69; Macintosh, Macintosh Plus, Macintosh 512 A10 cables, \$119 each; Macintosh SE A20 video cable, \$119; Macintosh II A35 adapter, \$245; VGA A40 video adapter, \$199; CGA/EGA A60 video adapter, \$119; additional memory modules, \$1,595. International power supplies available from distributors.

Requires: CGA, EGA, or VGA graphics adapter; overhead projector.

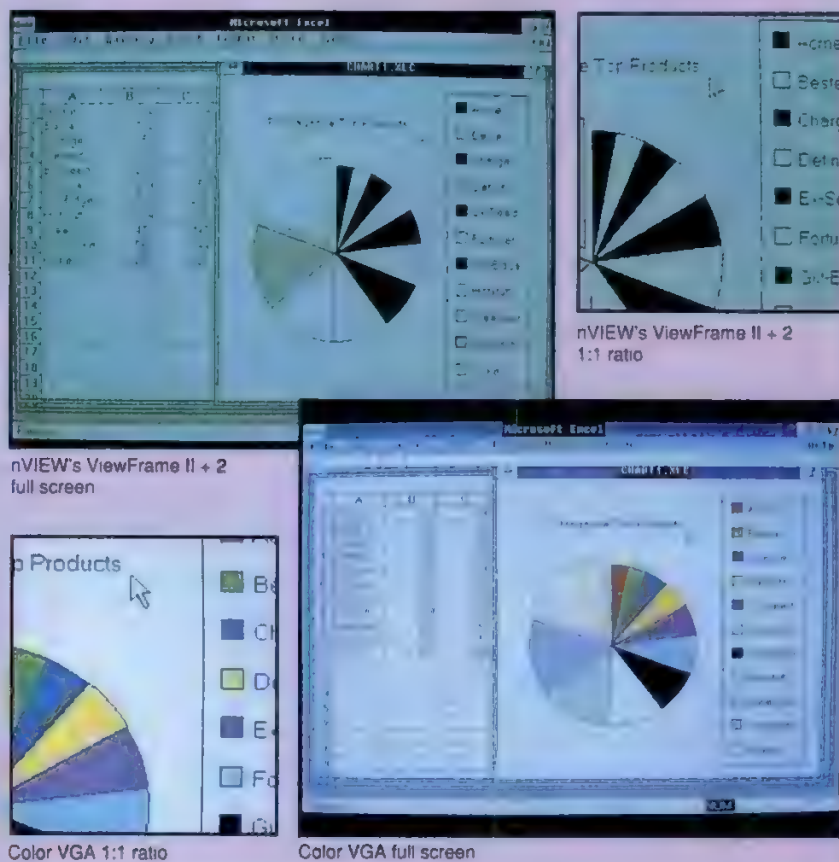
In Short: Although more expensive than many other LCD panels reviewed here, the two VGA-resolution PC Viewer products we reviewed have features not found elsewhere. The 480C PC Viewer, the only true color LCD panel on the market, projects vibrant colors with high contrast. The 480GS/2 PC Viewer projects black-and-white images with eight shades of gray and includes a powerful memory module that allows you to store and project images in a slide-show format.

CIRCLE 403 ON READER SERVICE CARD

LCD PANELS: HIGH-CONTRAST IMAGES AT HIGH RESOLUTIONS

While early LCD panel designs were limited to CGA resolution and blue-on-yellow images, the latest models offer VGA resolution and high-contrast black-and-white images. The best systems produce images with easy-to-read characters on a uniform background—in color, to boot—like this one created with nVIEW's ViewFrame II + 2. The image is good, although it still does not equal the display on the VGA color monitor pictured next to it.

But while the first color LCD panel has now arrived on the market, it looks as if we will have to wait a little longer before we see reasonably priced displays with both a wide range of color and a good image.



text to look quite right; if some letters were properly weighted, others were too thin or too thick. We also experienced color bleeding on some of our tests.

STORING SCREENS FOR SLIDE SHOWS

The feature that differentiates the 480GS/2 PC Viewer from the competition is its Memory Module, which allows you to capture and store 50 VGA or 70 EGA computer screens of data and put them together as a slide-show presentation. This means your slide-show images can be

projected later, without using a computer. A presentation can become even more effective when you switch between projecting a previously stored slide show of computer images and projecting the program currently running on your PC.

Menu-driven Memory Module firmware gives you a great deal of control over the slide-show presentations you create. Dissolves, window shading, and selective time delay between screens allow for a great deal of flexibility in your presentations. Memory Module presentations are

HARDWARE LCD PANELS



In Focus Systems' 480C PC Viewer (top) is the first LCD projection panel to display eight true colors rather than represent colors as shades. The 480GS/2 PC Viewer (bottom) is the only panel we reviewed that includes a memory module capable of storing up to 70 EGA or 50 VGA screens.

directed with a remote control designed to work with the firmware menus.

The 480GS/2 projects black-and-white images using eight shades of gray to represent colors. You can also choose from two alternative palettes, one of which uses patterns to represent the eight standard IBM colors. Another palette uses black to represent black, while all other colors are represented by white.

Using the contrast, sync, and tracking controls, we were able to reduce ghosting problems, although the projected image was never entirely free of vertical ghosting. We found that the contrast needed to be adjusted whenever the display was switched to reverse video. The 480GS/2 proved to have the same problems displaying text as its colorful cousin did.

One of the few projection panels without a fan, the 480GS/2 didn't seem to suffer from overheating with extended use. In Focus Systems claims its heat-resistant glass can handle temperatures as high as 149 degrees Fahrenheit.

The 480C PC Viewer is a real breakthrough in LCD projection panel technology, representing the first of the next generation of these panels. The relatively slow pixel response of both PC Viewer systems, however, is noticeable and may be problematic if you plan to use either one for projecting animated sequences. On the positive side, both offer high-contrast images, and that means sharp-looking presentations.

While each is at the high end of the price spectrum, the cost may be worth it to access features not supplied by any other LCD projection panel reviewed here.

nVIEW CORP.

ViewFrame II + 2

by Henry Fersko-Weiss

The ViewFrame II + 2 panel produces an excellent overhead image. The contrast is superb, and it yields eight true shades of gray. As a result, both text and graphics are sharp and clear. The panel also comes standard with an American Tourister hard-shell carrying case, three sets of cables for CGA/EGA, VGA, and the Macintosh II, and utility software—all for \$1,995.

One of the reasons for the great visual quality of the ViewFrame II + 2 panel is the double supertwist nematic LCD it uses. This LCD technology allows for very high contrast. The black-and-white color scheme also helps make the image crisp while maintaining a clear background.

Although the image is excellent, the panel has low transmissivity; in other words, the image isn't very bright. You can partially compensate for this problem by using a very bright overhead projector, but by doing this, you invite the problem of overheating. ViewFrame uses a single internal fan and two active air layers to dissipate heat. Its metal shell—which certainly makes it less prone to damage—is also supposed to aid cooling. But after a half hour of continuous use you can start to see a darkening, or blooming, of the image in some places. As time goes on, the blooming worsens.

AMPLE ADJUSTMENT CONTROLS

ViewFrame has ample controls for adjusting the image. The contrast knob gives

FACT FILE

EDITOR'S CHOICE

ViewFrame II + 2

nVIEW Corp., 11835 Canon Blvd., Newport News, VA 23606; (804) 873-1354.

List Price: With ViewFrame II + 2 utility disk, CGA/EGA Y cable, VGA Y cable, Macintosh II Y cable, power supply, American Tourister hard-shell carrying case, \$1,995; Macintosh SE and Macintosh Plus adapter kits, \$149 each; DEC VT 340 adapter kit with cable, \$249; AT&T cable, \$49; composite cable, \$49; DEC VT 220 cable, \$49; Atari cable (monochrome or color), \$99; Hercules monochrome cable, \$49; Toteboard (an infrared wireless keyboard for IBM and compatibles), \$395.

Requires: IBM, Macintosh, Apple, Atari, AT&T, Olivetti, or DEC VT 220 or VT 340 graphics adapter; overhead projector.

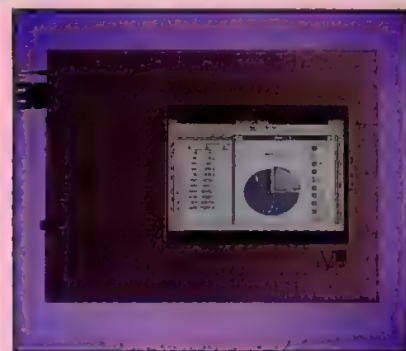
In Short: The ViewFrame II + 2 produces images with excellent contrast and a true eight shades of gray. Its imaging problems are weak transmissivity and blooming. But the panel also comes with three Y cables to hook up to a CGA/EGA, VGA, or Macintosh system, a hard-shell carrying case, and utility software. This combination of accessories and good imaging makes it an excellent buy.

CIRCLE 404 ON READER SERVICE CARD

you a full range of bright-to-dark, and there are three color knobs for adjusting the gray scale.

Getting the right proportion of red, green, and blue can be tricky, and nVIEW provides a utility disk to help you get the optimal setting. If you set the colors according to the on-screen scale, you will get the clearest separation of grays. I noticed, however, some image shimmering with this setting. If you change the color settings you can almost completely eliminate it, but you lose some of your grays.

Other controls let you shift the image



nVIEW Corp.'s ViewFrame II + 2 comes with an American Tourister hard-shell carrying case, three sets of cables (for CGA/EGA, VGA, and the Macintosh II), and utility software.

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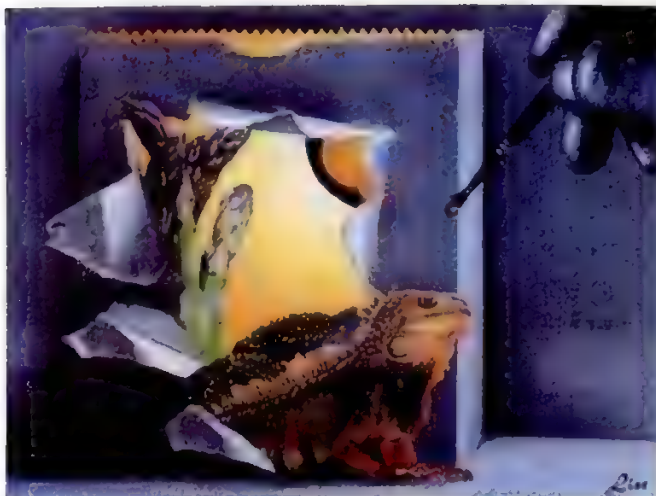


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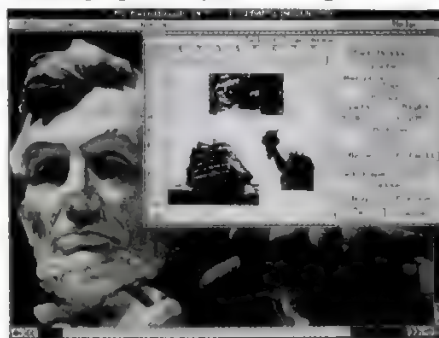
The new PC Paintbrush IV Plus is packed with innovations. New retouching features let you blend, lighten, darken, adjust contrast, change tints and blur portions of any image. New image processing functions let you automatically correct poor originals. It's like having a photo lab in your computer!

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For compelling overheads, slides and documents, choose from a huge arsenal of features. For example, use the "tiling" feature to create 3-D effects and intricate textures. Automatically shadow, outline and graduate text for dynamic effects. Load and save PCX and TIFF images. Capture screens. You can even overlay two images.

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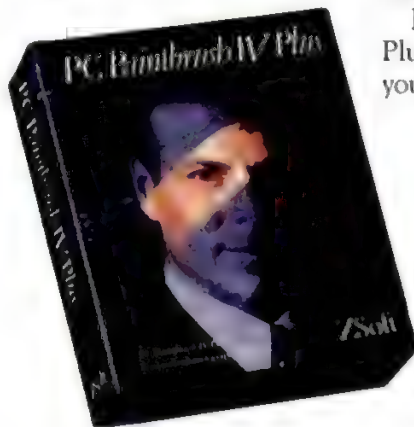
PC Paintbrush IV Plus is packed with convenience: Pull-down menus, customizable screen layouts, graphically labeled options,



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ZSoft

CORPORATION

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CIRCLE 744 ON READER SERVICE CARD

horizontally or vertically; invert the background and foreground colors; choose between a true gray scale or a pixel pattern, and fine-tune the focus. The ViewFrame has an AutoJust feature that stores the horizontal and vertical adjustments you make and automatically remembers them on power-up.

There is no power switch on the ViewFrame, which can be irksome. To start the panel you have to plug in the power supply cord. If you're turning the panel on and off and back on again, you either have to drop the cord to the floor or tie it on somewhere.

The cable that connects the panel to your computer uses a Y splitter so you can drive both the panel and a monitor at the same time. This cable is ten feet long, but you can purchase longer cables from nVIEW.

The ViewFrame II + 2's greatest strength is its combination of a splendid image—blooming notwithstanding—nice standard accessories, quality construction, and compatibility with a wide range of computers. It's an attractive combination.

SHARP ELECTRONICS CORP.

Sharp QA-50

by Henry Fersko-Weiss

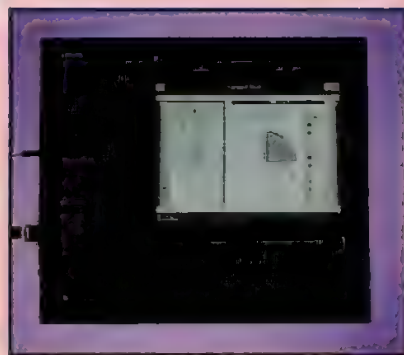
When it comes to styling and ergonomics, Sharp Electronics knows what it's doing. Its QA-50 LCD panel, encased in black plastic, is sleek and modern. It provides a full set of controls and comes with a handy remote control unit. The icing on the cake is that the QA-50 delivers a clear and precise image.

Sharp is one of the few LCD panel manufacturers to make its own components. This gives the company tight control over quality and, theoretically, promises reliability. It also means that buyers can get good service from authorized Sharp dealers. These factors make the QA-50's \$1,395 price quite competitive.

THE GOOD WITH THE BAD

In the IBM arena, the system is compatible with CGA, EGA, and VGA signals. Its image is good because of the panel's high contrast, adequate transmissivity, and desirable aspect ratio. Text characters are well formed and consistently sized. Graphics images are only ever so slightly elongated.

HARDWARE LCD PANELS



Sharp's QA-50 LCD panel, encased in black plastic housing, is sleek and modern-looking. It provides a full set of controls and comes with a handy remote-control unit. The icing on the cake is that it delivers a clear and precise image.

The black-and-white panel uses dithering, not true grays. The advantage is that pie and bar charts will have clearly demarcated elements, and you won't get the shimmering effect you sometimes see in true gray-scale panels.

But there are drawbacks. In certain instances the combination of a foreground and background dither pattern is visually jarring. If this happens in a text area, the characters may get obscured or become completely unreadable.

Sometimes you can correct the problem by choosing another of the eight dither combinations, using the On/Shading but-

ton on the top of the panel. If this doesn't work, you can adjust the red, green, and blue levels with dials located in a covered compartment. This compartment also houses buttons to tune the frequency and phase. Fiddling with these may fix the problem, but sometimes nothing helps.

The only other choice is to switch from the dithering to the black-and-white mode with the Off/RGB button. You must map each of your eight color choices to either black or white. At points where the foreground and background are both mapped to white or black, the image will be canceled out. Playing with the Off/RGB Select button may or may not help.

THOUGHTFUL DESIGN

Both the On/Shading and Off/RGB controls have digital LED indicators, so you can clearly see the number of the selection you're making. This is one of many thoughtful design aspects. Additionally, all buttons are well labeled and spaced. The remote device has the same buttons as the main panel and can be used from behind the projector at a distance of up to 25 feet.

On the side of the panel you have 9- and 15-pin ports, a power socket, and the on/off switch. Cleaning is relatively simple—remove four screws on the top housing to get to the underside of the glass cover.

The panel itself fits nicely on the overhead projector. The border of the shell isn't very wide, so the vertical bar that holds the projector's optics doesn't force the LCD off the center of the light source.

The impressive design adds to the system's attractions. This, along with its high contrast, clear imaging, and relatively low price, makes the QA-50 an appealing system.



Sharp QA-50

Sharp Electronics Corp., Professional Products Division, Sharp Plaza, Mahwah, NJ 07430; (201) 529-8731.

List Price: With remote control unit, 15-pin cable, 9-pin cable, power supply, \$1,395; hard-shell shipping case, \$99; soft carrying case, \$65; Apple II interface, \$149.

Requires: CGA, EGA, VGA, MCGA, Macintosh, or Apple II graphics adapter; overhead projector.

In Short: The Sharp QA-50 is very sleekly designed. It has a good set of controls and comes with a remote device. The panel is basically black and white, but it uses dithering to simulate eight gray shades. Sometimes the dither patterns make it very difficult to read text. If dithering isn't used, portions of an image may drop out. The unit has good contrast, decent brightness, and an excellent price.

CIRCLE 405 ON READER SERVICE CARD

TELEX COMMUNICATIONS INC.

Magnabyte 5040

Magnabyte 5080-120

by Catherine D. Miller

Telex Communications, an early presence in the LCD panel market, has a new line of LCD projection panels. The Magnabyte 5040 (\$1,350) is a CGA-only model, while the Magnabyte 5080-120

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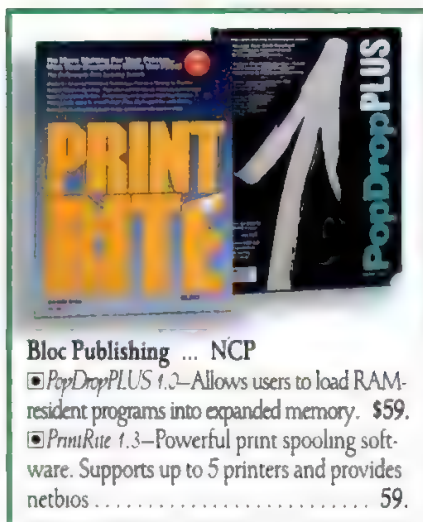
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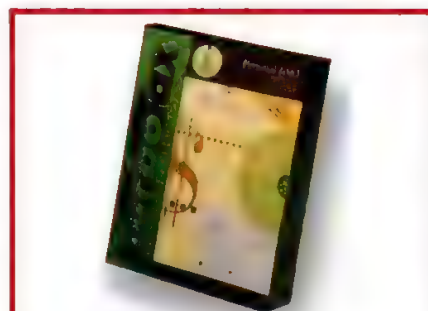


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 2323 ☐ HyperACCESS/5 1.0 (DOS & OS/2) 115.
IBM ... NCP
 6187 ☐ Storyboard Plus 2.0 239.
 6186 ☐ DisplayWrite 4 2.0 249.
Individual Software ... NCP
 2408 ☐ Professor DOS 4.0 27.
 6222 ☐ Resume Maker 1.0 29.



Chipsoft ... NCP

☐ Turbo Tax 1989 Personal 1040 7.0—Award winning tax preparation software with over 50 federal income tax forms & schedules. Includes a cross-referenced help system. 1989 World Class PC Award Winner. \$45.

PC CONNECTION

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Microsoft ... NCP

Excel for OS/2 1.0—Spreadsheet which allows you to take full advantage of the power and flexibility of OS/2. Sophisticated analytical tools, easy-to-use Presentation Manager interface, and much more \$339.

Intuit ... NCP

2426 Quicken 3.0 39.

Lord Publishing ... NCP

5191 Ronstadt's Financials 1.02 145.

Lotus ... NCP

5417 1-2-3 3.0 call

5653 1-2-3 2.2 call

5134 Magellan 1.0 149.

4131 Agenda 1.0 275.

2660 Freelance Plus 3.01 345.

MECA ... NCP

4529 CheckWrite Plus 1.1 29.

4603 Andrew Tobias' Tax Cut

for 1989 Taxes 49.

2798 Managing Your Money 6.0 119.

Microcom ... NCP

2775 CarbonCopy Plus 5.1 (2 req.) 115.

6236 Relay Gold 4.0 149.

Micrografix ... NCP

6294 Draw Plus 1.0 289.

Micro Logic ... NCP

2968 Tornado 1.8 55.

Microlytics ... NCP

2731 GOfier 2.0 (new version) 45.

Microrim ... NCP

2835 R:BASE for DOS (version 2.1) 489.

Microsoft ... NCP

2860 Learning DOS 2.0 35.

2899 Windows 286 2.1 69.

2904 Works 2.0 99.

2900 Windows 386 2.1 129.

2901 Word 5.0 209.

6195 Word for Windows 329.

2856 Excel 2.1 (req. 80286/80386) call

6033 Excel for OS/2 1.0 339.

5188 QuickPascal 1.0 69.

2894 QuickBASIC 4.5 69.

2895 QuickC 2.0 69.

2853 C Compiler 5.1 299.

Mouse Systems ... NCP

5739 Power Panel 1.0 59.

5995 Marq Plus 1.0 59.

Multisoft ... NCP

4925 PC-Kwik Power Pak 1.5 79.

Nantucket Software ... NCP

2970 Clipper (Summer '87) \$429.

New England Software ... NCP

4337 GB-Stat 1.5 159.

Nolo Press ... NCP

2982 WillMaker 3.0 35.

5122 For The Record 1.0 35.

North Edge Software ... NCP

2987 Timeslips III 3.4 169.

4277 Timeslips III Network Edition 3.4 399.

Norton-Lambert ... NCP

4928 Close-Up Customer 3.0 135.

4929 Close-Up Support 3.0 165.

5420 Close-Up LAN (8 user) 529.

On Track Computer Sys. ... NCP

5490 Disk Manager 4.0 49.

Paperback Software ... NCP

3142 VP-Planner 3D 1.0 169.

PC Globe ... NCP

5902 PC Globe 3.0 39.

5900 PC USA 1.0 39.

Personics ... NCP

3126 SeeMORE 2.0 54.

4328 Look & Link 1.1 59.

Peter Norton ... NCP

3152 Norton Commander 3.0 89.

3146 Advanced Utilities 4.5 89.

Quarterdeck ... NCP

3221 Expanded Memory Mgr. 386 5.0 59.

3220 DESQView 2.26 79.

4586 DESQView 386 129.

Reference Software ... NCP

4396 Grammatik IV 1.0 52.

Revolution Software ... NCP

4480 VGA Dimmer 2.01 (screen saver) 19.

3254 Cruise Control 3.02 39.



North Edge Software ... NCP

Timeslips III 3.4—Track every minute's efforts, then print the invoice and log the receivable all from the convenience of Timeslips III. Menu-driven and memory resident, this is a must for your service business. \$169.

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RightSoft ... NCP

4155 RightWriter 3.1 \$54.

Samna ... NCP

5799 Ami Professional 1.0 319.

Softlogic Solutions ... NCP

3546 Disk Optimizer 4.05 45.

3542 Software Carousel 3.01 55.

Softview ... NCP

3474 MacInTax for Windows (1989 taxes) 65.



Software Publishing ... NCP

Harvard Graphics 2.13—Be "free and easy" with the industry's best-selling presentation graphics package. Now with Draw Partner—a free drawing accessory (normally \$149 List). Graphically the best choice \$339.

Software Publishing ... NCP

3499 PFS:First Publisher 2.1 89.

3481 PFS:First Publisher Art Gallery 1.0 84.

4342 PFS:First Graphics 1.0 89.

3478 PFS:First Choice 3.02 105.

3496 Professional Write 2.11 149.

3493 Professional File 2.01 199.

3482 Harvard Graphics 2.13 339.

4669 Harvard Graphics Access. Pk. 1.0 299.

5992 Office in a Box (includes First Choice, First Publisher, & Intuit Quicken 3.0) 159.

Spinnaker ... NCP

4441 Resume Kit 1.29 25.

4446 8-in-1 2.0 39.

Symantec ... NCP

5383 Budget Express 1.0 99.

3427 Q & A Write 1.01 139.

3412 Grandview 1.0 189.

3425 Q & A 3.0 229.

3431 Timeline 3.0 399.

TOPS ... NCP

3724 NetPrint 2.0 (share printers) 119.

3726 TOPS 2.1 115.

3725 TOPS Repeater 125.

3720 Flashcard 2.1 (AppleTalk network card; 1 year warranty) 159.

Traveling Software ... NCP

4190 Battery Watch 2.0 (3 1/2" only) 35.

3729 LapLink Mac 2.0 79.

5179 LapLink III 3.0 85.

3727 DeskLink 2.2 (includes First Choice) 99.

True BASIC ... NCP

3561 True BASIC 3.0 52.

Vericomp ... NCP

3765 SoftBytes 2.0 35.

Hours after sunset

Volkswriter ... NCP

5046 ☐ Volkswriter 4 (w/Correct Grammar) \$109.

WordPerfect Corp. ... NCP

3799 ☐ WordPerfect Library 2.0 75.

3804 ☐ WordPerfect 5.1 265.

3806 Additional Network Stations 5.1 169.

WordStar USA ... NCP

2825 ☐ WordStar Prof. Release 5.5 229.

5000 ☐ Upgrade to Release 5.5 89.

Wordtech Systems ... NCP

3810 ☐ DBXL 1.3 145.

Xerox ... NCP

5084 ☐ Xerox Presents 1.0 339.

4539 ☐ Professional Extensions 1.0 389.

3812 ☐ Ventura Publisher 2.0 call

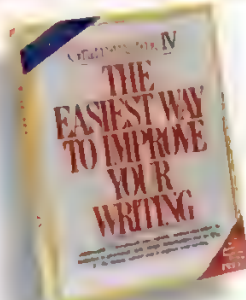
XTREE ... NCP

6161 ☐ XTREE Pro Gold 1.0 75.

5526 ☐ XTREENet File Server 229.

XYQUEST ... NCP

4393 ☐ XyWrite III Plus 3.55 229.



Reference Software ... NCP

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6023 ☐ Leisure Suit Larry III 39.

4345 ☐ King's Quest IV (512k version) 39.

5695 ☐ Manhunter: San Francisco 33.

4456 ☐ Police Quest II 39.

5106 ☐ Space Quest III 36.

6022 ☐ Colonel's Bequest 36.

Spectrum Holobyte ... NCP

5993 ☐ Welltris (Tetris sequel) 22.

4283 ☐ Falcon/AT (F-16 simulation) 32.

5187 ☐ Vette 32.

Spinnaker ... CP

5580 ☐ Sargon IV 32.

Stone & Assoc. ... NCP

3435 ☐ My Letters, Numbers, Words (2 to 6) 22.

3439 ☐ 2nd Math (ages 7 to 16) 27.

Sublogic ... NCP

3335 ☐ Jet (requires CGA or EGA) 33.

True BASIC, Inc. ... NCP

☐ Kemeny/Kurtz Math Series:

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Broderbund ... CP

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Accolade ... CP

6031 ☐ Hardball 2 26.

6030 ☐ Test Drive 2: The Duel 29.

Broderbund ... CP

1417 ☐ Where/Europe Carmen Sandiego? 29.

5701 ☐ Where/Time Carmen Sandiego? ... 32.

5851 ☐ Sim City 33.

Electronic Arts ... CP

5798 ☐ Ferrari Formula I 29.

5806 ☐ F-16 35.

4659 ☐ Chessmaster 2100 35.

5804 ☐ Deluxe Paint II (Enhanced) 89.

Konami/Ultra Software ... CP

6194 ☐ Teenage Mutant Ninja Turtles ... 29.

Microprose ... CP

4454 ☐ F-19 Stealth Fighter 39.

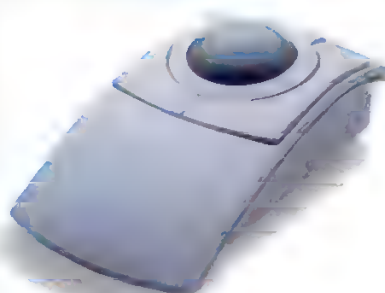
5823 ☐ Red Storm Rising 39.

Microsoft ... NCP

2858 ☐ Flight Simulator 4.0 All New 39.

Parlor Software ... CP

3159 ☐ Bridge Parlor 2.3 49.



MicroSpeed ... 1 year

PC-TRAC Trackball—New ergonomic design requires a desk space less than 4 inches wide. Emulates two button mice and includes software drivers to adjust resolution. PC-TRAC Serial . \$75. PC-TRAC Bus . \$85.

HARDWARE

Manufacturer's standard limited warranty period for items shown is listed after each company name. Some products in their line may have different warranty periods.

AST Research ... 2 years

1223 I/O Mini 2 C/S/P \$89.

1299 SixPakPlus 384k C/S/P 189.

4107 RAMpage Plus 286 512k 419.

Brother International ... 1 year

5787 HL-8e Laser Printer 1899.

5788 HL-8Ps PostScript Laser Printer ... call

5786 Toner/Drum Kit 99.

Central Point ... 1 year

5042 Copy II PC Deluxe Option Board . 115.

Compucable ... 2 years

1604 2-Position switch box 25.

1605 3-Position switch box 35.



Revolution Software ... NCP

☐ Cruise Control 3.02—Boost cursor speed. Stop cursor run-on. "Highly recommended", Jim Seymour, PC Week \$39.

☐ VGA Dimmer 2.01—Screen saver for VGA, EGA, CGA, Hercules, Mono 19.

Corvus ... 1 year

6184 ReadyNet Starter Kit 319.

6183 ReadyNet Add-On Kit 165.

Cuesta ... 1 year

1608 Datasaver 400 Watt (power backup) 429.

Curtis ... lifetime

1689 Diamond 29.

1690 Diamond Plus 41.

1694 Emerald SP-2 36.

1707 Ruby SPF-2 (6 outlets;

EMI/RFI filtered; 6 ft cord) 55.

1708 Ruby-Plus SPF-2 Plus

(w/FAX & modem protection) 65.

Diconix ... 1 year

5655 150 Plus Printer (Parallel) 359.

Epson ... 1 year

We are an authorized Epson Service Center.

1906 FX-850 (80 col., 264 cps, 9 pin) ... call

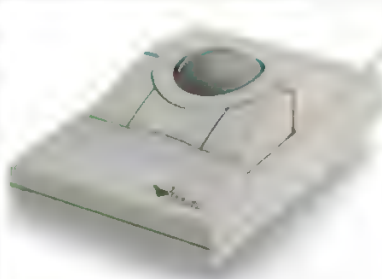
1904 FX-1050 (136 col., 264 cps, 9 pin) . . call

5183 LQ-510 (80 col., 180 cps, 24 pin) . . 349.

1930 LQ-850 (80 col., 264 cps, 24 pin) . . call

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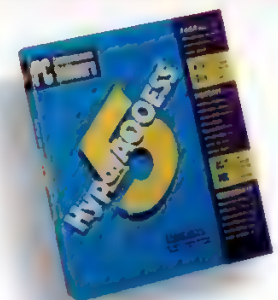


Mouse Systems ... 1 year
PC Trackball—Get mouse functionality with a fraction of the desk space. 100% Microsoft Mouse compatible. Includes Pop-Up Menus, Ultra-Res, and Presentation Magician software. *Serial* \$75. *Bus*..... \$85.

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- 1917 LQ-1050 (136 col., 264 cps, 24 pin) call
- 4116 LQ-2550 (136 col., 333 cps, 24 pin) call
- 5184 LX-810 (80 col., 180 cps, 9 pin) . 199.
- 1052 Printer-to-IBM cable (6 feet) . 15.
- 5th Generation ... 1 year**
- 3952 Logical Connection 512k. 529.
- Hayes ... 2 years**
- 2304 Smartmodem 1200 289.
- 2307 Smartmodem 2400 429.
- 2308 Smartmodem 2400B (w/Smartcom II) 429.
- Hercules ... 2 years**
- 2318 Graphics Card Plus. 189.
- 5120 VGA Card 189.
- Intel ... 5 years**
- 4696 2400B Internal Modem 159.
- 2352 2400B Internal Modem 2 (for PS/2) 249.
- 5119 2400 Baud External Modem 179.
- 2346 Inboard 386/PC w/1 Meg 579.
- 4266 Above Board Plus 512k 419.
- 4267 Above Board Plus I/O 512k 449.
- 5336 Above Board Plus 8 2 Meg 699.
- 5342 Above Board Plus 8 I/O 2 Meg 739.
- 4272 Above Board 2 Plus 512k 469.
- 5396 Above Board MC 32 0k (upgradable to 8 Meg) 359.
- 4275 Connection Coprocessor 769.
- MATH COPROCESSORS**
- 2370 80287-8 (for 8 MHz 80286 CPU's) . 199.
- 2369 80287-10 (for PS/2 Models 50 & 60) 229.
- 4750 80387SX (for 80386SX CPU's) . . . 309.
- 2371 80387 (for 16 MHz 80386 CPU's) . . 349.
- 2372 80387-20 (for 20 MHz 80386 CPU's) 399.
- Kensington Microwave ... 1 year**
- 2582 Masterpiece Plus 109.
- 5697 Expert Mouse (Trackball for PS/2) . 115.
- Keytronic ... 3 years**
- 4518 101 Plus Keyboard 99.
- Kraft ... 5 years**
- 5801 New Game Adapter (2 game ports) . 27.
- 5800 3 button Thunder Joystick 29.
- 5802 Trackball 69.
- Logitech ... limited lifetime**
- 5464 Series 2 Mouse (C9 for PS/2's) . . . 69.

- 5151 HiREZ Mouse (C9) \$85.
- 6029 Trackman (Trackball) serial 85. bus 89.
- 4297 ScanMan Plus (hand scanner) . . . 185.
- Magnavox ... 2 years**
- 5990 13" VGA Monitor (CM9032)(1 yr. wrnty) 349.
- 4761 13" VGA Monitor (9CM062) 389.
- Micron Technology ... 2 years**
- 5818 Beyond 640 EMS Board 1 MB (exp. to 8 MB w/daughter card) 369.
- 5821 Beyond EX Extended Memory Board 2 MB (exp. to 4 MB w/daughter card) 599.
- 6005 Ascend Memory Board for Compaq (4 Meg) 729.
- Microsoft ... lifetime**
- 2897 Mouse with Paintbrush 109.
- 2898 Mouse with Windows 286 2.1 139.
- MicroSpeed ... 1 year**
- 6007 PC-TRAC Trackball serial 75. bus 85.
- 6010 FastTRAP 3D Trackball serial 99. bus 109.
- Mouse Systems ... lifetime**
- 5994 OmniMouse II w/PC Paint Plus 49.
- 5845 White Mouse (bus or serial) 69.
- 5997 Trackball (1 yr. wrnty.) serial 75. bus 85.
- 4306 PC Mouse II w/PC Paint+ 89.
- NEC ... 2 years**
- 4799 Multisync 2A (VGA Monitor) 499.
- 5085 Multisync 3D Monitor 689.
- 6208 Multisync 4D Monitor 1199.
- Orchid Technologies ... 4 years**
- 3069 Tiny Turbo 286 (accelerator board) 219.
- 5105 ProDesigner VGA (800 x 600) 249.
- PC Power & Cooling Sys. ... 1 yr**
- REPLACEMENT POWER SUPPLIES**
- 3202 Turbo Cool 150 (25° - 40° cooler) 129.
- 3205 Turbo Cool 250 (25° - 30° cooler) 169.
- 3200 Silencer 150 (84% noise reduction) 115.

- Practical Peripherals ... 5 years**
- 3101 1200 Baud Internal Modem \$69.
- 3100 1200 Baud External Modem (mini) . 77.
- 3103 2400 Baud Internal Modem 139.
- 3102 2400 Baud External Modem 179.
- 5286 2400 Baud Int. MNP Modem (Lev. 5) 175.
- 5285 2400 Baud Ext. MNP Modem (Lev. 5) 209.
- 4542 2400 Baud Internal Modem for PS/2. . 229.
- 3095 Mini Parallel Print Buffer 32k (expandable to 512k) 75.
- Safe Power Systems ... 2 years**
- 4561 Safe 250W (standby power bkup) 249.
- 4562 Safe 425W (standby power bkup) 369.



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HyperACCESS 5.0—"Must-own," John C. Dvorak. Blasts data through modems faster than any other program. Potent, agile, civilized. Automation breakthrough ... it learns your work! Contains DOS & OS/2 vers. . . . \$115.



Intel ... 5 years
2400bps Modems—Reliable connections, 100% Hayes compatibility, and a great price.
 2400EX (external) \$179.
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- SOTA Technology ... 2 years**
- 5107 Floppy Drive Controller (S/P) 99.
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- 5402 SOTA 386i-16 (16 MHz accelerator) 389.
- Targus ... lifetime**
- 4899 Nylon Laptop carrying case 55.
- 6037 Premier leather carrying case . . . 199.
- TheComplete PC ... 2 years**
- 5598 TheComplete Half Pg. Scanner 400 189.
- 4885 TheComplete Answering Machine 249.
- 4887 TheComplete FAX 9600 429.
- 5140 TheComplete Page Scanner 549.
- 5828 TheComplete Communicator (includes 9600 Baud FAX, voice mail, and 2400 Baud Modem on a single card) 559.
- Toshiba ... 1 year**
- 3684 T1000 Laptop (80C88, 6.4 lbs.) . . . 669.
- 4958 T1600 Laptop (12 MHz, 20 Meg) . . . 3249.
- Tripp Lite ... 2 years**
- 6198 Isoblok (2 outlets, direct plug-in) . . . 29.
- 6199 Isobar 4 (4 outlets, 6 ft. cord) 49.
- 6200 Isobar 6 (6 outlets, 6 ft. cord) 59.
- 6201 Isobar 8 (8 outlets, 12 ft. cord) 69.
- 6202 Isobar 8 Remote (8 outlets) 79.
- 6203 Isotel (4 outlets, RJ II protection) . . 59.
- 6019 LS 600 Line Stabilizer 85.
- 6018 LC 1200 Line Conditioner 159.
- Video 7 ... 7 years**
- 3778 VEGA VGA 219.
- 5883 1024i VGA (includes 512k) 289.
- 4931 VRAM VEGA 512k 449.

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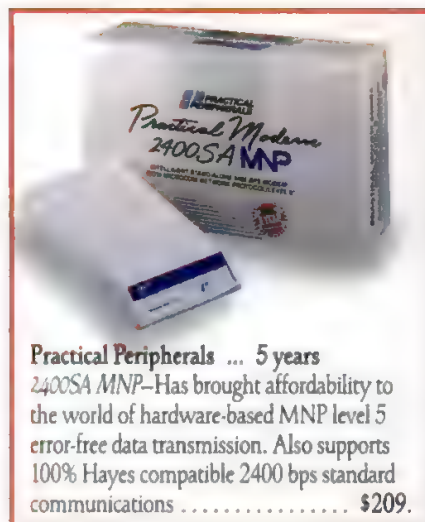
DTC ... 1 year	
6248 AT Floppy/Hard Drive Controller (1:1 interleave)	\$129.
IOMEGA ... 1 year	
5116 Bernoulli II Single 44 Meg Internal	995.
5117 Bernoulli II Dual 44 Meg External	1969.
5113 44 Meg Cartridge Tripak (5 1/4")	249.
2499 PC2 Card (controller required)	169.
2500 PC2B Card (bootable card)	229.
Mountain Computer ... 1 year	
2917 40-60 Meg Internal Tape Drive	379.
2935 40-60 Meg Int. Tape Drive for PS/2	379.
5502 83-152M Ext. Tape Drive	759.
5500 83-152M Int. Tape Drive	629.
6153 DC2120 Cartridge (5 pack)	135.
5190 DC2000 Pre-formatted Cartridges ea.	35.
Pacific Rim ... 1 year	
5010 1.2 Meg External	215.
5011 360k External 5 1/4" Drive	179.
Plus Development ... 2 years	
3105 Hardcard 20 Meg (49 ms)	549.
3106 Hardcard 40 Meg (28 ms)	699.
Seagate ... 1 year	
FREE PCTV® Hard Drive Installation Tape with purchase of 20, 30 or 40 Meg Seagate drive for the IBM PC (not for AT). Beta or VHS.	
2285 20 Meg Internal Hard Drive ST225 (w/controller and cables, 65 ms)	289.
2286 30 Meg Internal Hard Drive ST238 (w/controller and cables, 65 ms)	299.
4554 40 Meg Int. HD ST251-1 (28 ms)	359.
2287 40 Meg Int. HD for PC ST251-1 (w/controller and cables, 28 ms)	429.
4624 80 Meg Int. HD ST4096 (28 ms)	619.
TEAC ... 1 year	
4950 PC, XT 360k Drive (5 1/4")	79.
4951 720k Drive (specify XT or AT, 3 1/2")	79.
4670 1.44 Meg Drive for XT (3 1/2")	99.
4326 1.44 Meg Drive for AT (includes Bastech software utilities, 3 1/2" copy prot.)	119.

Toshiba ... 1 year

3649 AT 1.2 Meg Drive (5 1/4")	\$99.
4755 AT 1.44 Meg Drive (3 1/2"), includes Bastech software utilities)	119.

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4807 Laser Labels 1" x 2 5/8" (Qty. 3000)	24.
4811 Laser Transparencies 8 1/2" x 11" (Qty. 50)	22.
CompuServe	
1676 CompuServe Information Service	24.
Cables ... lifetime	
1019 Smartmodem-to-AT cable (10 feet)	15.
5511 Right Angle Printer cable (6 feet)	15.
1050 Parallel Printer cable (15 feet)	19.
PC Connection ... lifetime	
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1074 3' Table (in oak, teak, or walnut)	79.
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3248 256k DRAMs (120 nanosecond)	call
4366 1 Meg x 9 SIMMs (100 nanosecond) call	
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2789 Maxell MD2-D (10 disks per box)	13.
4192 Verbatim Datalife (10 disks per box)	13.
5 1/4" DS/High Density Disks (1.2 Meg)	
3770 Verbatim Datalife (10 disks per box)	19.
3292 Sony (10 disks per box)	19.
2790 Maxell MD2-HD (10 disks per box)	19.
3 1/2" DS/DD Diskettes (720k)	
3297 Sony (10 disks per box)	14.
3772 Verbatim (10 disks per box)	15.
2792 Maxell (10 disks per box)	15.
3 1/2" DS/High-Density Diskettes (1.44 Meg)	
3298 Sony (10 disks per box)	29.
3773 Verbatim (10 disks per box)	29.
2793 Maxell (10 disks per box)	29.



Peter Norton ... NCP

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- ☐ Norton Utilities Advanced Edition 4.5—Ends the "terror messages". 89.



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HARDWARE LCD PANELS



The Magnabyte 5040 (left) uses the same LCD technology as the Magnabyte 5080-120 (right), but it represents 16 colors at CGA resolution by using eight shades—from yellow to magenta to blue—to represent the standard colors of the default IBM color palette, adding a crosshatch pattern to represent the remaining eight intensified IBM palette colors.

(\$1,620) has VGA resolution and will work with any graphics adapter.

Telex and Chisholm have worked to-



FACT FILE

Telex Communications Inc., 9600 Aldrich Ave. South, Minneapolis, MN 55420; (800) 828-6107, (612) 884-4051.

Magnabyte 5040

List Price: With IBM PC and Apple II straight-through cables, power supply, \$1,350; hard-shell carrying case, \$99.95; IR remote control, \$125; CGA interface, \$125; *Show Partner* software, \$100; IR remote control, CGA interface and *Show Partner*, \$275.
Requires: CGA or Apple interface card, overhead projector.

CIRCLE 406 ON READER SERVICE CARD

Magnabyte 5080-120

List Price: With power supply, \$1,620; hard-shell carrying case, \$99.95; AT&T/Olivetti cable, \$82; Macintosh 512/SE/Plus cable assembly, \$210; Telex presentation software, \$100; universal interface connector \$400; 15-pin straight-through cable, \$150; EGA cable, \$150; VGA cable, \$150; IR remote control \$125.

Requires: CGA, MCGA, Hercules, EGA, VGA, Macintosh II, Macintosh 512, Macintosh SE, or Macintosh Plus graphics adapter.
In Short: Both Magnabyte models project shades ranging from yellow to magenta to blue to represent true color. A CGA-only LCD projection panel, the Magnabyte 5040 projects a sharp image using eight shades and a crosshatch pattern. Designed to work with any graphics adapter, the Magnabyte 5080-120 offers a maximum VGA resolution of 640 by 480. The control panel of each can be difficult to work with, detracting from the attractiveness of the panels.

CIRCLE 407 ON READER SERVICE CARD

gether to design their VGA-resolution units, so the Magnabyte 5080-120 LCD panel and remote control look like and are functionally identical to Chisholm's Looking Glass. (For a complete description, see our review of the Chisholm Looking Glass Light Writer 480LW in this roundup.) However, the cable connecting the panel to the computer's graphics card and the remote control are sold separately by Telex for \$150 and \$125, respectively. Note also that Telex does not offer the Light Writer electronic tablet-and-pen combination available with the Chisholm unit.

While the Magnabyte 5080-120 achieved slightly better scores on our contrast tests than did the Looking Glass, the latter did better on our percent transmissivity and bloom ratio tests. The differences, though, were not so statistically significant that they would be an issue in your buying decision.

CGA STYLE

The Magnabyte 5040 uses the same LCD technology as the Magnabyte 5080-120, but it renders 16 colors at CGA resolution by using eight shades—from yellow to magenta to blue—to represent the eight standard colors of the default IBM color palette; it adds a cross-hatch pattern to represent the remaining eight intensified IBM palette colors.

Six color palettes are available, including the default palette. You can increase the contrast between elements in your image by changing to another palette that



EDITORS' CHOICE

■ nVIEW'S VIEWFRAME II + 2

The best of the LCD panels help you make the most of your presentations by offering support for high-resolution modes and eight or more levels of gray, as well as excellent contrast and elegant controls.

The ViewFrame II + 2 LCD panel meets all these requirements, producing an image with excellent contrast and sharp focus. Its gray scale of eight shades lets you represent eight colors so they can be clearly discerned on the screen.

The controls on the panel are quite good. You can make very fine adjustments to the levels of red, green, and blue being translated into shades of gray. The contrast knob gives you a full range of control.

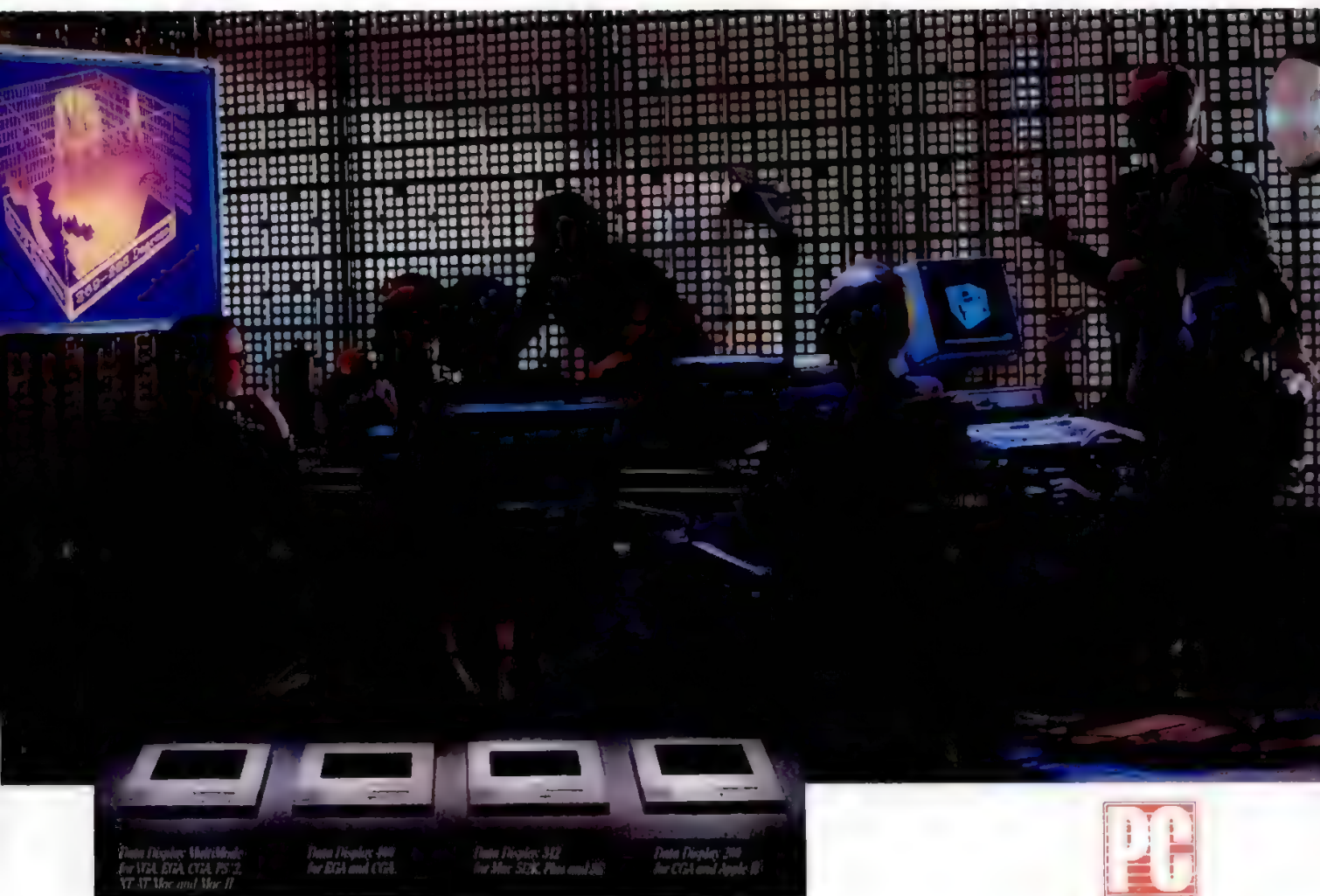
nVIEW built the ViewFrame II + 2 to withstand the rigors of traveling from one presentation to the next. The housing around the double supertwist nematic panel is metal rather than plastic. For even better protection nVIEW provides an American Tourister hard-shell carrying case as part of the standard system.

Other standard accessories are three Y cables that connect a CGA/EGA, VGA, or Macintosh system and a very useful utility disk that makes adjusting the panel's gray scale quite easy. With the Y cable you can run a monitor and the panel at the same time.

Even though the panel costs \$1,995 you get a lot of value for your money. Given the very good image, sturdy design, and nice accessories, the ViewFrame II + 2 is hard to beat.

Honorable mention goes to In Focus Systems' 480C PC Viewer. This VGA resolution system heralds a new generation of true color LCD panels. Its eight colors are stunning, its clear image provides great contrast, and bloom problems are nonexistent. Unevenly weighted text was a problem, but if you need color the \$4,995 system is a worthwhile albeit expensive answer.

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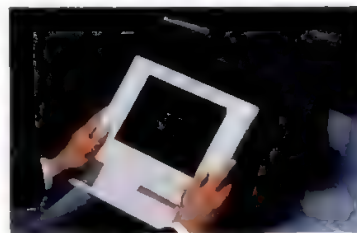
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HARDWARE
LCD PANELS

uses different shades to represent individual colors. The default palette, for example, uses shade number 3 to represent green. When you change to palette number 5, green will be represented by shade number 7, which will be darker than the original shade used. This would be useful to increase contrast in an image that uses colors represented by similar shades in one palette, but not in another.

Although buttons on the Magnabyte 5040's control panel look identical to those of the 5080-120, they function slightly differently. Unlike the other unit, the 5040's control panel does have some labels, making operation slightly easier than for the Magnabyte 5080-120. But you'll still need the manual to learn how to use the controls. A helpful quick reference card is also included.

When we first set up the panel, the display had a lot of shimmering, but by adjusting the frequency and focus, we were able to get a sharp image. No amount of adjusting, however, could solve the uneven color saturation across the screen when we were projecting the image in reverse video. That problem was evident before the panel was on the projector for long. We also found that the Magnabyte 5040's fan is noisier than that of any of the other panels we reviewed.

While the Magnabyte 5040's scores on our contrast and percent transmissivity tests were better than those of its VGA counterpart, the bloom ratios were nearly identical.

Using yellow, magenta, and blue shades to represent colors, the two Magnabyte LCD panels project sharp images on the screen. If ease-of-use is more important to you than resolution, the CGA-only Magnabyte 5040, with its partially labeled control panel, wins over its sibling. But if you must have VGA resolution and don't need the Light Writer pen and tablet that can be bundled with the Chisholm product, the 5080-120 is equally worthy of your consideration. ■

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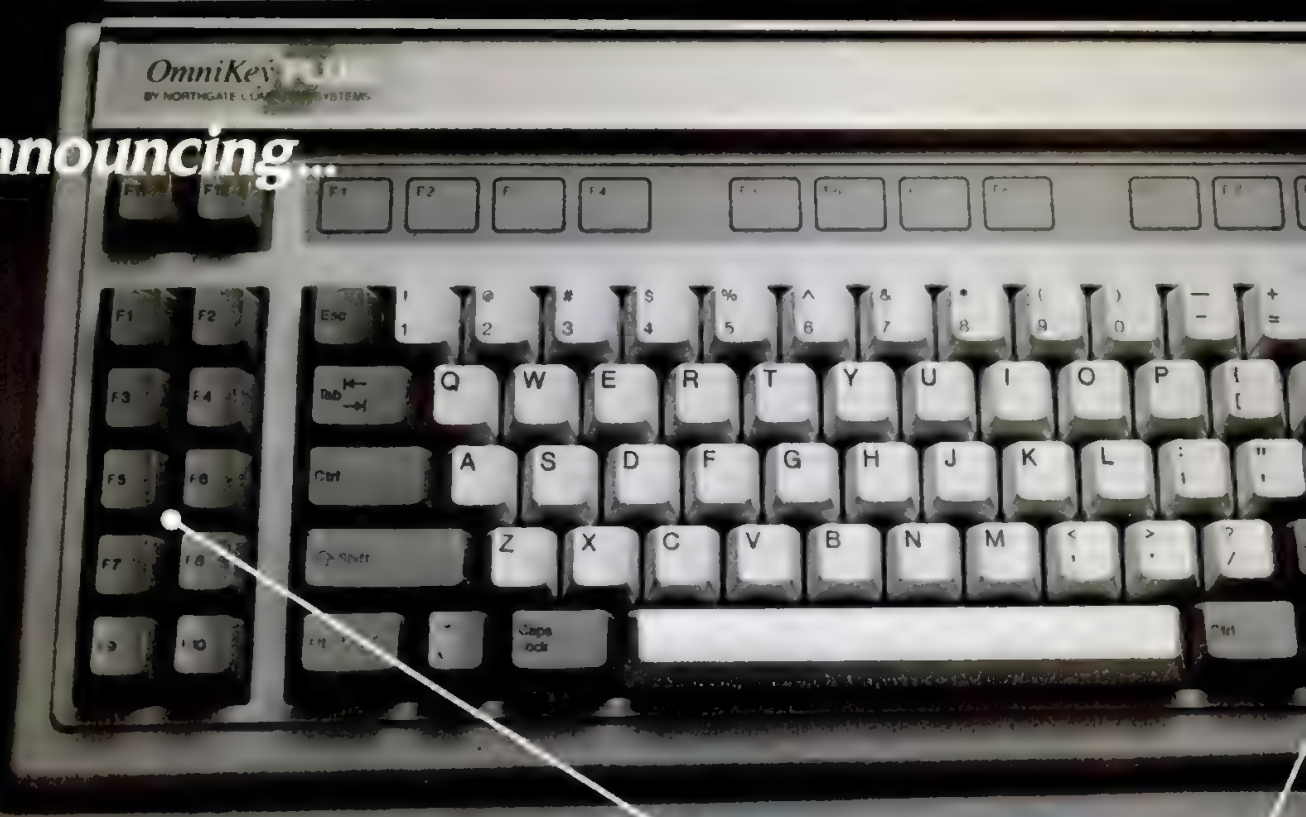
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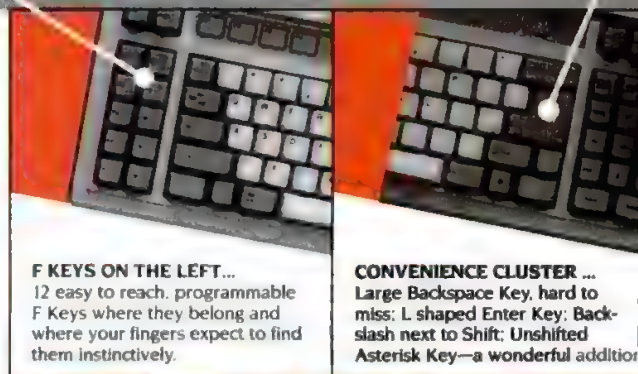
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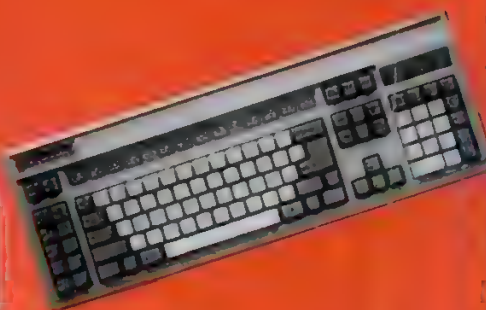


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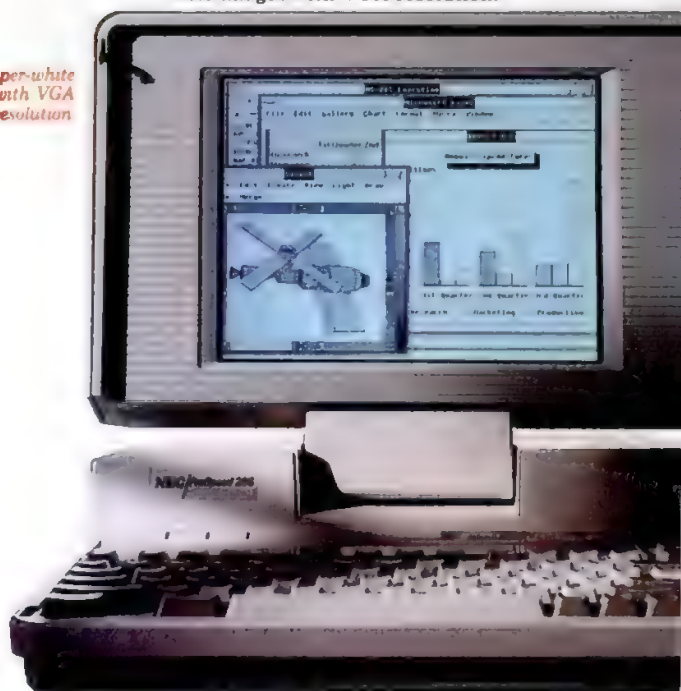


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Excel For OS/2

A New Home For an Old Favorite

by Richard Hale Shaw

The first spreadsheet designed for Presentation Manager sets an impressive standard for future OS/2 applications.



Although OS/2 formally shipped in late October 1988, it's taken a while for the first Presentation Manager applications to appear. Not surprisingly, the first crop consists of programs adapted from *Microsoft Windows* applications.

Excel for OS/2, also known as *PM Excel*, is Microsoft's first offering for the Presentation Manager, and it's also the Pre-

sensation Manager's first spreadsheet program. But with its first-place finish comes a hefty amount of scrutiny. How does it differ from its *Windows* predecessor? Will its performance under OS/2 really be that much better? And how does it compare with *Lotus 1-2-3*, Release 3, for OS/2?

Rather than a pounding, feature-by-feature comparison for the spreadsheet pundits, we'll take a look at *Excel* for OS/2 from a Presentation Manager perspective: how well it exploits the best aspects of OS/2, and the impact of PM's graphical user interface (GUI) on *Excel* when compared with a non-PM spreadsheet such as *1-2-3*.

THE EXCEL PHILOSOPHY

Microsoft has been very clear about where it thinks application software is headed in the 1990s. *Excel*, perhaps better than any other Microsoft product, is the embodi-

relies on a markedly different visual interface provided by its underlying operating environment. After further examination, it's clear that PM *Excel* is slicker and more iconic when run under OS/2 1.2 than under *Windows/386*.

Using OS/2's improved font technology, PM *Excel* offers you a greater choice of fonts—up to 256. Not only can you create as many rich charts and graphs as you could with the *Windows* version, but you can now have snappier-looking worksheets to go with them. By using smaller fonts, you can view a larger area of any given worksheet at a time. As an example, PM *Excel*'s highly legible 8-point Helvetica font allows you to view over 120 characters and 37 rows displayed on a standard VGA monitor.

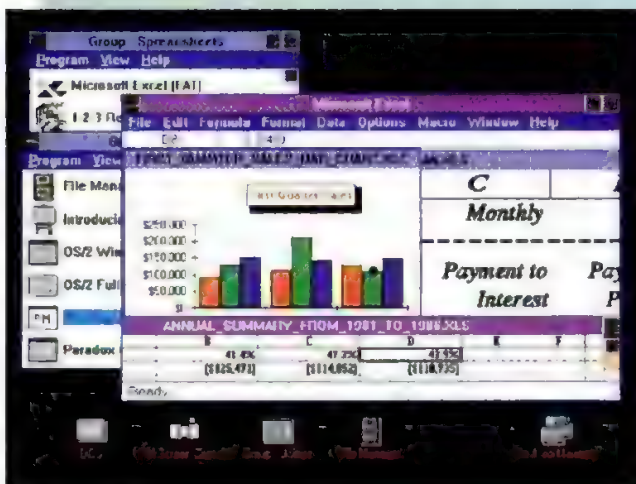
You can also assign a different font style to each worksheet, so that when you

PM EXCEL VS. LOTUS 1-2-3 3.0 FOR OS/2

While the differences in the two versions of *Excel* are largely subtle, the contrast between the two OS/2 spreadsheet programs is much more striking.

Lotus 1-2-3, Release 3, is a character-based application with versions that run under both OS/2 and DOS. Both versions are provided in the same package. After spending time with *Excel*'s graphical user interface, *1-2-3* seems clumsy and command-laden. Where *Excel* shines at letting you display, edit, and switch among multiple worksheets with the click of a mouse, *1-2-3* doesn't employ a mouse interface. This is all the more surprising because a mouse interface is as intrinsic to OS/2 as a keyboard.

The lack of a mouse driver makes it comparatively awkward to get around *1-2-3*. And unlike many other non-PM applications, you can't run it in a PM window. We found that when we switched to



Microsoft's *Excel* for OS/2 lets you set multiple fonts in multiple worksheets, creating rich-looking spreadsheets alongside presentation-quality charts.

Excel for the
Presentation Manager
shines at letting you
display, edit, and
switch among multiple
worksheets with the
click of a mouse.

ment of those ideas. PM *Excel*'s design is based on an effort to create a great spreadsheet that offers interoperability among a variety of computing environments.

At a glance, the PM version of *Excel* is indistinguishable from the Macintosh and *Windows* versions. For Microsoft, creating a version of *Excel* for another operating environment such as the OS/2 Presentation Manager meant first providing interoperability. Only after that commitment was met would the company try to take advantage of the operating environment, and then only to make it a "truly great spreadsheet."

On the surface, the two PC versions of *Excel* look the same: they are file, macro, and interface compatible. But each version

load several worksheets into different windows it's easier to distinguish between them as you switch windows. However, you should be judicious when choosing your fonts: if your font choice is too complex, PM *Excel* will slow to a crawl when redisplaying the worksheet.

There are some other minor differences between the two versions of *Excel*. The *Windows* version often had trouble accepting high-order ASCII characters typed into a cell, such as decimal 200. The PM version doesn't exhibit this problem, but on the other hand it lacks the fine tutorial that comes with *Windows Excel*. And while *Windows Excel* can read *dBASE III* .DBF files, *Excel-OS/2* can also access .DBFs generated by *dBASE IV*.

its full-screen session under OS/2 1.2, *1-2-3* consistently crashed.

Additional differences abound: *1-2-3* 3.0 offers yet another new file format—the .WK3 extension, which handles .WK1 files from previous versions transparently. PM *Excel*, however, happily uses the same .XLS files as its *Windows* predecessor. And while *1-2-3* 3.0 running under OS/2 cannot recognize the long filenames you can generate with OS/2 1.2's High Performance File System (HPFS), PM *Excel* can read HPFS filenames just fine.

PM *Excel* even offers support for PM's Clipboard and Dynamic Data Exchange. *1-2-3* 3.0 doesn't and probably won't as long as it's a character-mode application. The problem lies in the fact that both Clip-

board and Dynamic Data Exchange are PM facilities; character-based programs such as *1-2-3* can't take advantage of them without considerable pain.

CONSOLIDATE VS. 3-D

Choice of interface is perhaps the most obvious way in which the spreadsheet philosophies at Lotus and Microsoft have manifested themselves. But another, less obvious difference is their choice of features, which demonstrates how these companies believe their products are used. Each has offered a significant new feature for performing operations across several worksheets: Lotus offers 3-D spreadsheets, while Microsoft provides spreadsheet consolidations.

The 3-D spreadsheet is *1-2-3* 3.0's angle on the future. Just as you can extend a range horizontally or vertically through a single worksheet, 3-D offers the ability to extend a range back through a stack of worksheets. This arrangement allows you to treat cells in more than one spreadsheet as a single unit or part of a range. And you can store these stacked worksheets in the same file.

Limitations? The 3-D facility works only on a range of worksheets stored in the same file with exactly the same worksheet structure. If you want to connect unrelated worksheets, you'll need to use the *1-2-3* linkage facility.

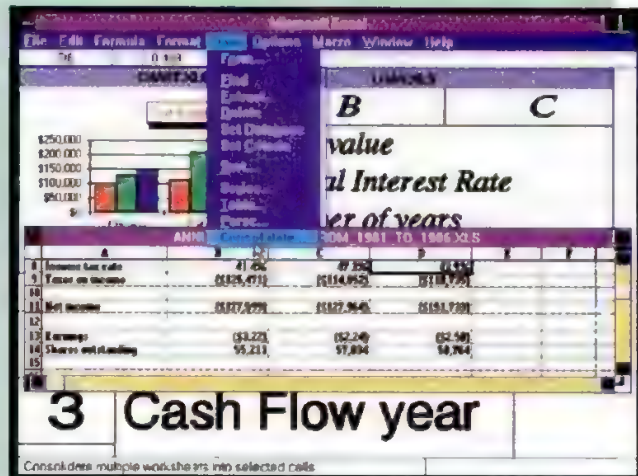
PM *Excel*, on the other hand, offers worksheet consolidation. This feature lets you bring the contents of a set of diverse worksheets together, into a selected area of yet another worksheet. The pertinent contents of each of the diverse worksheets are identified by ranges or labels. You can consolidate up to 256 sheets, selecting one of several different functions (SUM, AVERAGE, COUNT, and so on), and bring together data from structurally different sheets. The disadvantage of this scheme, however, is that consolidations are not dynamic or permanent: a change to a selected cell in a source worksheet will not change the destination worksheet, and there's no way to tell where the data came from unless you document its source.

EXCEL, 1-2-3, AND OS/2

Under *Windows*, applications like *Excel* run at an acceptable speed. But loading too many worksheets or other applications simultaneously brings the system to a crawl.

For example: with automatic recalculation turned on, *1-2-3* 3.0 will automatically recalculate a newly loaded spreadsheet

The new Consolidate command lets you unite portions of up to 256 unrelated worksheets. Another change is the ability to use longer, more-descriptive filenames with the OS/2 High Performance File System.



but will do this in the background as soon as *1-2-3* displays the READY indicator. Thus, you can start performing operations on the worksheet immediately while the background recalc proceeds. This is also true for *1-2-3* 3.0 under DOS—which has no built-in multitasking facilities.

Excel under *Windows* will also recalculate a newly loaded worksheet when automatic recalculation is turned on—but, unfortunately, the recalcs proceed as a foreground process with the mouse pointer displayed as the hourglass icon. You can continue to edit a worksheet while a recalc is under way, but, under *Windows*, *Excel* will suspend the recalc as soon as it senses a keypress or a mouse click. If you are idle for a few moments, the recalc begins again on its own.

This presents a situation in *Windows* that, for OS/2 users, is simply unacceptable. Even worse, the *Windows* version of *Excel*'s recalculation process significantly slows down other programs that are run-

ning in the background.

Unfortunately, this is the way *Excel* for *Windows* works, and here Microsoft's noble concern for interoperability between these products overshadows what becomes a natural productivity gain for OS/2 users. The issue is exacerbated when you are loading or saving a large worksheet to the disk: you'll have to stare interminably at that silly hourglass.

Oddly, Microsoft's own guidelines to PM developers suggest that operations that can take more than a tenth of a second be placed in a background process so that users don't have to wait. We would have preferred that Microsoft follow its own advice rather than pursuing interoperability in this instance. And while Microsoft touts *Excel*'s use of OS/2's virtual memory, you should take this with a grain of salt, since the feature is available to *all* OS/2 programs—including *1-2-3* 3.0.

However, this does mean that you can load an extravagant number of very large worksheets in PM *Excel* without a significant change in the program's performance. In addition, Microsoft has made it easier for users of the *Windows* version to move to PM *Excel* by demanding only 2.5MB of memory rather than the full OS/2 requirement of 4MB, although 4MB RAM is recommended.

Extended OS/2 1.2 filenames of up to 255 characters are available to any OS/2 program that wants to use them, and the cut-and-paste facilities of the PM Clipboard are available to any PM program: *1-2-3* can't read the long filenames and isn't a PM application, so *Excel* beats *1-2-3* on these counts. With long file-

Although Microsoft touts *Excel*'s use of OS/2's virtual memory, this feature is available to *all* OS/2 programs—including *1-2-3* 3.0.

names, you can create more-descriptive names for your worksheet, macro, and chart files; and with the Clipboard, you can cut-and-paste data to and from *Excel* worksheets and other applications.

In all, experienced users of the *Windows* version of *Excel* are going to love the performance of *PM Excel*—as witnessed by our benchmark test results. However, those of us who've been using the Presentation Manager on a daily basis since its release may find the occasional waiting periods annoying.

PM EXCEL AND DDE

Perhaps the most powerful capability in *PM Excel*, and the one with the greatest implications for future productivity, is a facility that's available to any Presentation Manager or *Windows* program: Dynamic Data Exchange (DDE).

Like the Clipboard, DDE is a facility for transferring data from one application to another. But unlike the Clipboard, in which the user initiates and controls on-time transferences of data between applications via "cut-and-paste," DDE is more transparent. While a user may instruct an application to carry out a DDE "conversation" with another program, the two programs can continue to transfer and receive data without any help from the user. Thus, DDE allows an application program to send or receive data updates on a real-time basis.

What's so terrific about this feature? After all, it was available in the *Windows* version of *Excel*. Simply put, *Microsoft Windows* simply isn't powerful and efficient enough to support DDE at anything better than tortoiselike speed. On the same hardware platform, however, OS/2 is quite capable of juggling the overhead of a DDE conversation and simultaneously servicing the needs of a half dozen other multitasking applications.

The implications of this feature are enormous. Take the classical DDE example: a communications program like Hilgraeve's *HyperACCESS/5* for OS/2 is pulling stock prices off the Dow Jones News Service. Through a DDE conversation initiated by *PM Excel*, it sends *PM Excel* the price information on specific stocks. *PM Excel* then uses the data to update the cells of a worksheet that contains a financial portfolio. *PM Excel* also updates a chart (in another *PM Excel* window) based on the worksheet. Then, via yet another DDE conversation, *PM Excel* sends a range of cells from the worksheet to a



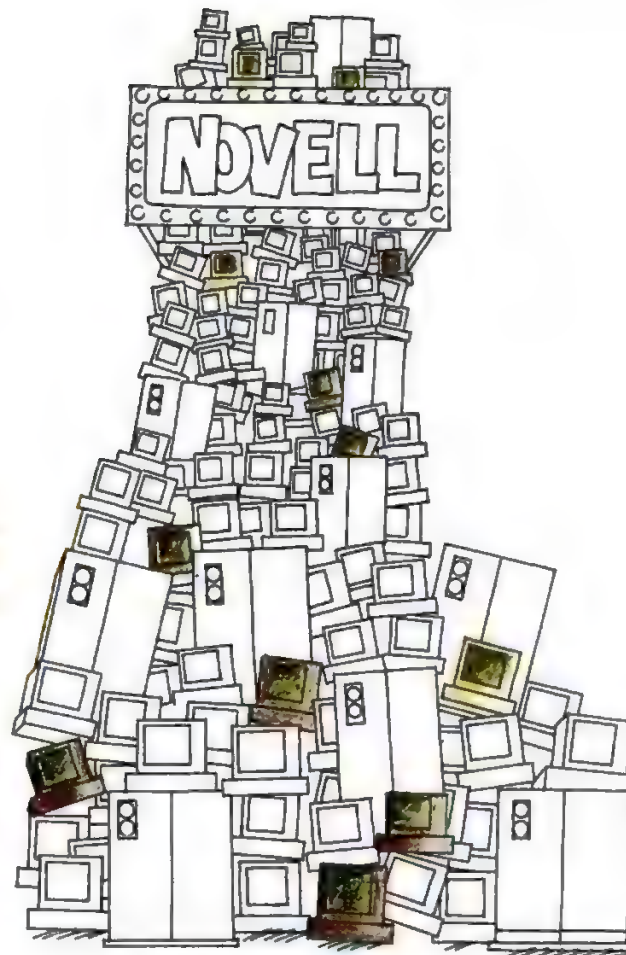
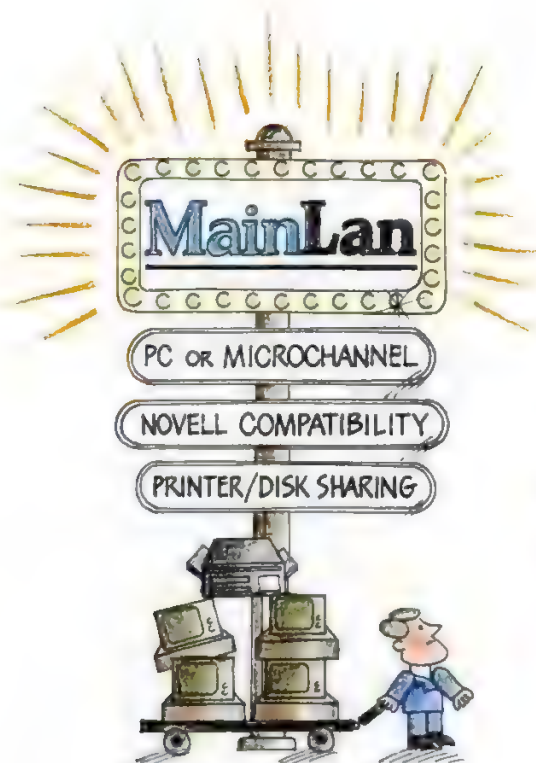
EXCEL FOR OS/2: SUMMARY OF FEATURES

(Products listed in alphabetical order)

List price	Excel for OS/2 \$495	Excel for Windows \$495	Lotus 1-2-3, Release 3.0 \$495
HARDWARE CONFIGURATION			
Uses expanded memory	☒	☒	☒
Uses sparse memory matrix	☒	☒	☐
Uses coprocessors:			
8087	☐	☒	☐
80287	☒	☒	☒
80387	☒	☒	☒
Lets user reconfigure hardware from within program	☐	☐	☒
SCREEN CAPABILITIES			
Screen indicates functions toggled on or off:			
CapsLock	☒	☒	☒
ScrollLock	☒	☒	☒
NumLock	☒	☒	☒
Insert/Overtype	☒	☒	☒
Other (specify)	☐	☐	☒ (End key)
Number of rows on-screen (worksheet area only)	37	29	20
Number of characters displayed across screen	121	87	82
Lets user change screen colors	☒	☒	☐
Titles:			
Vertical	☒	☒	☒
Horizontal	☒	☒	☒
Split Screens:			
Maximum number	4	4	3
Format independently	☒	☒	☒
Scroll independently	☒	☒	☒
Displays high-bit ASCII characters	☒	☐	☒
Displays formulas in worksheet	☒	☒	☐
WORKSHEET CHARACTERISTICS			
Maximum work area (rows x columns)	16,384 x 256	16,384 x 256	8,192 x 256
Range of column widths:			
Minimum	0	0	1
Maximum	255	255	240
Maximum number of characters per cell	255	255	512
Maximum number of characters in a range name	255	255	15
WORKSHEET MANIPULATION			
Single command to return to ready state	☒	☒	☐
Number of strokes to blank a single cell	4	5	5
Can enter cell contents and move to next cell with arrow keys	☒	☒	☒
Undo for complex commands (single step backup through menus)	☒	☒	☒
Formats cell to display numbers as words	☐	☒	☒
Pointing allowed for copying and moving	☒	☒	☒
Hide feature:			
Rows	☒	☒	☐
Columns	☒	☒	☒
Individual cells	☒	☒	☒
Cell protection:			
Individual cells	☒	☒	☒
Range	☒	☒	☒
Recalculation:			
Row	☒	☒	☒
Column	☒	☒	☒
Natural	☒	☒	☒
Logical	☐	☐	☐
Manual	☒	☒	☒

☒—Yes ☐—No

CONTINUES



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—PC Magazine
(Connectivity Labs)

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—Personal Computer World

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—Computer Reseller News

PC

VERDICT

	P A G E			
PERFORMANCE	○	○	●	○
EASE OF USE	○	○	○	●
DOCUMENTATION	○	○	○	●
VALUE FOR MONEY	○	○	○	●

4 POOR 3 AVERAGE 2 GOOD 1 EXCELLENT

—PC Magazine, UK Edition

Besides being the most compatible PC LAN on the market, MainLan simplifies big network features for small users. It provides disk/printer sharing, as well as file transfer, E mail, data security and network management. Install MainLan in about 15 minutes, and you can run your multi-user applications right away!

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EXCEL FOR OS/2: SUMMARY OF FEATURES

(Products listed in alphabetical order)

	Excel for OS/2	Excel for Windows	Lotus 1-2-3, Release 3.0
Automatic	■	■	■
Intelligent	■	■	■
Error recovery	■	■	■
Macros:			
Number of statements, commands, and keywords	224	224	124
Learn mode for macros	■	■	■
Macros reside in worksheet or library	Both	Both	Both
Multiple spreadsheet functions:			
Overlays spreadsheets	☐	☐	■
Adds or subtracts spreadsheets	■	■	■
Multiplies or divides spreadsheets	■	■	■
Joins spreadsheets without overlaying (edge to edge)	☐	☐	■
OPERATORS AND FUNCTIONS			
Number of logical and arithmetic operators	13	13	14
Total number of functions:			
Math (including trigonometry)	22	22	17
Logic	6	6	8
Finance	13	13	12
Date and time	12	12	13
Statistics	14	14	10
Other (specify)	64 (11 database, 20 information, 8 lookup, 4 matrix, 21 text)	64 (11 database, 20 information, 8 lookup, 4 matrix, 21 text)	39 (11 database, 15 string, 4 lookup, 7 cell and range, 2 error handling)
FILE MANIPULATION			
Saves partial spreadsheet (Extract)	■	■	■
Warns against file overwrite	■	■	■
Automatic backup	☐	☐	☐
User can choose file extensions	■	■	■
Non-alphanumeric characters in filename	■	☐	■
File formats supported (import/export)			
dBASE	■ / ■	■ / ■	■ / ■
.DIF	■ / ■	■ / ■	■ / ■
Symphony	☐ / ■	☐ / ■	■ / ■
.WKS	■ / ■	■ / ■	■ / ■
.WK1	■ / ■	■ / ■	■ / ■
Other (specify)	■	■ (ASCII,SYLK)	■ (CGM) (ASCII,SYLK)
DATABASE			
Database can be larger than spreadsheet (reside partly on-disk)	■	■	■
Number of simultaneous sort keys	3	3	255
Data record search:			
By arithmetic criteria	■	■	■
By logical criteria	■	■	■
GRAPHING			
Number of graph types	7	7	7
Controls color and font size and style both on-screen and in printing	■	■	■
Prints directly from screen	■	■	■
COPY PROTECTION, HELP, AND SUPPORT			
Copy protected	☐	☐	■ (via key disk)
Context-sensitive help	■	■	■
Toll-free telephone number for support	☐	☐	■ (90 days only)

■—Yes ☐—No

ENDS

word processing program that places the updated stock prices in a table in a financial report document.

The result is that the user gets a visual, real-time image of the value of the stock portfolio from the chart, while the worksheet maintains the latest prices and the report document is kept up-to-date. Multi-tasking realized!

By supporting DDE in PM *Excel*, Microsoft has paved the way for a level of integration between diverse applications that has been discussed for years but never achieved. This also opens the door for a host of third-party applications and add-ins, such as *Q+E*, a database query-and-edit tool that Microsoft will be offering to PM *Excel* users later this year.

Q+E provides a visual interface to databases and allows you to see the data that you're going to join *before* you issue a

Database aficionados
will drool over tying a
PM *Excel* interface to
their databases.

JOIN command. Since it's a separate program that uses DDE to provide information to an application, any application that supports DDE will be able to use it as a database interface.

Even hard-core database aficionados will find it difficult not to drool over tying a PM *Excel* interface to their databases. And *Q+E* will provide both a graphical interface to *dBASE* databases as well as to those accessible only via an SQL server. Thus, DDE support may have greater impact on your long-term productivity than any other single feature of PM *Excel*.

HEAD-TO-HEAD TIMES 3

Users of the *Windows* version of *Excel* won't be unhappy with the Presentation Manager version: for the most part, the latter is more responsive than its *Windows* counterpart. While the recalculation engine is essentially the same in both versions—and thus provides almost identical performance—file saving is markedly better in PM *Excel*.

File loading is about the same for both, and both versions' file-handling is slower

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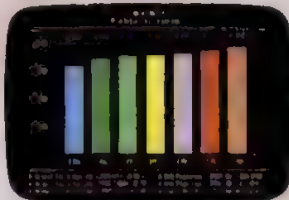
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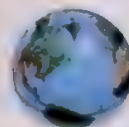
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If a problem affects the service or operation of a component purchased as a CompuAdd system (CPU, monitor, or keyboard) in the first 90 days, we will determine the cause and, if needed, ship a replacement part or product within 48 hours (depending on availability of part, via Federal Express® standard air—at our expense).

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Onsite service is available within 250 Miles. Telex service is available nationwide on all CompuAdd systems. The CompuAdd 220 and 300-series systems come with FREE onsite service during the initial one-year warranty period. Purchasers of other CompuAdd systems may buy a year of onsite service at the time of purchase. Extended two- and three-year warranties are also available on all CompuAdd systems. A completed service agreement must be received prior to onset of any onsite coverage.

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64730

- Built-in game port interface (cable required, 48954)
- Three full-size 16-bit and two half-size 8-bit expansion slots
- 80287 math coprocessor socket
- Choice of 5.25" 1.2MB or 3.5" 1.44MB diskette drive
- 101-key enhanced keyboard
- Monitor optional.

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If you thought you couldn't afford a 386, the 316s could change your mind. Power-packed on a small footprint, the 316s opens the door to 386 software at an exceptionally low price. Like all 386 machines, the 316s comes with one year of FREE onsite service. **\$1295**
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- 1MB memory expandable to 4MB on motherboard
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- Built-in dual hard drive interface
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- Built-in parallel port and two serial ports
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- Three full-size 16-bit and two-half-size 8-bit expansion slots
- 387SX math coprocessor socket
- Choice of 5.25" 1.2MB or 3.5" 1.44MB diskette drive
- 101-key enhanced keyboard
- Monitor optional.

CompuAdd 212 Monitor And Hard Drive Options

	MGA	EGA	CVGA
20MB (28ms)	64731 — \$1350	64736 — \$1709	64741 — \$1719
40MB (28ms)	64732 — \$1499	64737 — \$1849	64742 — \$1859
80MB (19ms)	64733 — \$1729	64738 — \$2079	64743 — \$2089

CompuAdd 316s Monitor And Hard Drive Options

	MGA	MVGA	CVGA
40MB (28ms)	64788 — \$1899	64791 — \$2009	64793 — \$2259
80MB (19ms)	64789 — \$2129	64792 — \$2239	64794 — \$2489
110MB (19ms)	64790 — \$2329	64796 — \$2439	64795 — \$2689

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PC Magazine, February, 1989

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- 0 wait state page-mode memory
- 1MB RAM expandable to 10MB
- Disk caching software
- LIM 4.0 support
- Dual diskette controller with dual hard drive interface
- Built-in parallel port and two serial ports
- Five available expansion slots
- 80387 math coprocessor socket
- Choice of 5.25" 1.2MB or 3.5" 1.44MB diskette drive
- 40MB hard drive

The CompuAdd 320

"The in-house engineered (320 and 325) are a big step in the right direction."

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PC Magazine, May 30, 1989

- 80386 processor running at 20MHz
- High-speed cache memory controller with 32KB of static RAM cache
- 1MB fully available RAM expandable to 16MB
- Disk caching software
- LIM 4.0 support
- ROM shadowing into faster DRAM
- Dual diskette controller with dual hard drive interface



- Monochrome VGA monitor
- 16-bit VGA video adapter card
- 101-key enhanced keyboard
- New Spinnaker Eight-in-One™ integrated software
- Free one-year onsite service

Color monitor optional

- Built-in parallel port and two serial ports
- Five available expansion slots
- 80387 math coprocessor socket
- Choice of 5.25" 1.2MB or 3.5" 1.44MB diskette drive
- 40MB hard disk drive
- Monochrome VGA monitor
- 16-bit VGA video adapter card
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- New Spinnaker Eight-in-One integrated software
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Color monitor optional

The CompuAdd 325

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PC Magazine, May 30, 1989

- 80386 processor running at 25MHz
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- 1MB full available RAM expandable to 16MB
- Disk caching software
- LIM 4.0 support
- ROM shadowing into faster DRAM
- Dual diskette controller with dual hard drive interface
- Built-in parallel port and two serial ports
- Five available expansion slots
- 80387 math coprocessor socket
- Choice of 5.25" 1.2MB or 3.5" 1.44MB diskette drive
- 40MB hard drive
- Monochrome VGA monitor
- 16-bit VGA video adapter card
- 101-key enhanced keyboard
- New Spinnaker Eight-in-One integrated software
- Free one-year onsite service

Color monitor optional

CompuAdd 316 Monitor And Hard Drive Options					
	MVGA		CVGA		
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80MB (19ms)	64813	\$2799	64818	\$3049	
110MB (19ms)	64814	\$2999	64819	\$3249	
150MB (18ms)	64815	\$3449	64820	\$3699	
CompuAdd 320 Monitor And Hard Drive Options					
	MVGA		CVGA		
40MB (28ms)	64823	\$2995	64829	\$3245	
80MB (19ms)	64824	\$3225	64830	\$3475	
110MB (19ms)	64825	\$3425	64831	\$3675	
320MB (18ms)	64826	\$4405	64832	\$4655	
CompuAdd 325 Monitor And Hard Drive Options					
	MVGA		CVGA		
40MB (28ms)	64836	\$3799	64842	\$4049	
80MB (19ms)	64837	\$4029	64843	\$4279	
110MB (19ms)	64838	\$4229	64844	\$4479	
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\$499

Flat Screen Monographics Combo features 12" monitor, monographics adapter card. \$1700 **\$139**

EGA Combo features 14" EGA color monitor and EGA-480 card. \$1702 **\$489**

Monographics VGA Combo 14" b/w monographics VGA monitor and CompuAdd VGA card. \$1708 **\$249**
Super VGA Combo includes the Mitsubishi Diamond Scan 14" color VGA monitor and a CompuAdd 16-bit VGA card. \$1706 **\$685**

Monitors

EGA 14" monitor offers the best value in an enhanced color monitor. Features 14" screen, 0.31mm dot pitch, and high-resolution up to 640x350. \$1210 **\$349**

Monographics 14" VGA analog monitor with 14" screen. The 0.31mm dot pitch provides for high-resolution up to 640x480. Capable of 64 shades of gray. \$1085 **\$139**
NEC MultiSync 2A Super VGA color analog monitor with 14" direct etch screen features up to 800x600 resolution, 0.31mm dot pitch resolution, autosynchronization and 38MHz bandwidth. \$1208 **\$510**

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- 8087 math coprocessor socket
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- 101-key enhanced keyboard
- Computer paper and ten blank diskettes

Color monitor optional.

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- 80286 processor running at 12MHz
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- 0 wait state page-mode memory
- Built-in dual hard drive interface
- Built-in dual diskette drive controller
- Built-in parallel printer port and two serial ports
- Built-in game port interface (cable required, 48954)
- Three full-size 16-bit and two half-size 8-bit AT class expansion slots
- 80287 math coprocessor socket
- Monographics monitor and adapter
- Panasonic® 1180 printer and cable
- Choice of 5.25" 1.2MB or 3.5" 1.44MB diskette drive
- CompuAdd MS-DOS v4.01 and GW-BASIC software
- New Spinnaker Eight-in-One integrated software
- Real-time clock
- 101-key enhanced keyboard
- Computer paper and ten blank diskettes

Color monitor optional.

Career Starter Kit Monitor And Hard Drive Options

	MGA	CGA	CVGA
No Hard Drive	64716 — \$899	64721 — \$1039	64726 — \$1259
20MB (69ms)	64717 — \$1179	64722 — \$1319	64727 — \$1539
40MB (69ms)	64718 — \$1329	64723 — \$1469	64728 — \$1689

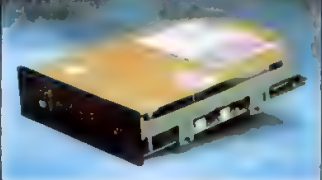
Professional Starter Kit Monitor And Hard Drive Options

	MGA	EGA	CVGA
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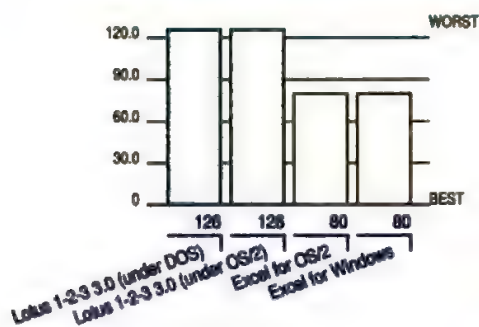


PERFORMANCE TESTS: EXCEL FOR OS/2

Microsoft's *Excel for OS/2* doesn't deliver any big surprises in the performance arena, turning in scores that are roughly equivalent to those achieved by its DOS cousin, the *Windows* version of *Excel*.

Memory Used

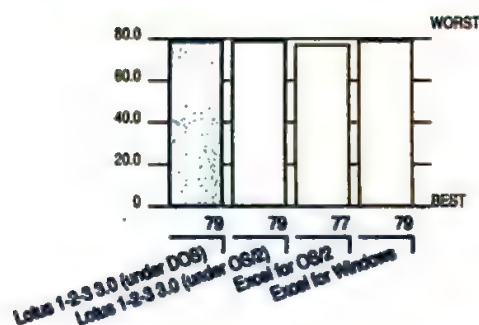
K of RAM



Memory Used reports the amount of RAM used by the Mathematical Worksheet Recalculation test file after it's loaded into the spreadsheet program. A smaller number indicates greater efficiency in spreadsheet memory management.

Disk Space

File Size in K



The Disk Space test reports the size of the Mathematical Worksheet Recalculation file when the spreadsheet program saves it to disk in the program's native file format. A smaller number here is better because it means there will be room for more or bigger files on the same disk.

Mathematical Worksheet Recalculation

Elapsed Time (seconds)

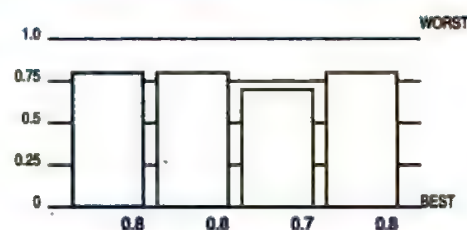
The Mathematical Worksheet Recalculation test reports the time taken to calculate a *Lotus 1-2-3 2.01* worksheet with 1,950 mathematical functions and 494 text cells. Lower times indicate more efficient implementation of standard spreadsheet functions.



Loan Recalculation

Elapsed Time (seconds)

The Loan Recalculation test worksheet calculates the monthly payment and displays the amortization schedule for a 10-year mortgage based on any given loan principal. This test is a typical spreadsheet application.



Internal Rate of Return Recalculation

Elapsed Time (seconds)

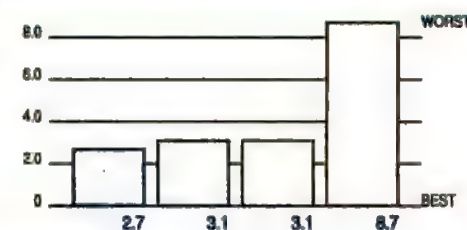
The Internal Rate of Return Recalculation test times the Net Present Value and Internal Rate of Return functions. These computation-intensive formulas indicate the efficiency of a program's calculation and Internal Rate of Return algorithms.



Save to Disk

Elapsed Time (seconds)

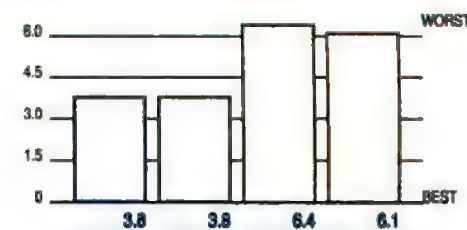
The Save to Disk test measures how long it takes the spreadsheet program to save the Mathematical Worksheet Recalculation test file to disk, using the product's native file format.



Load from Disk

Elapsed Time (seconds)

The Load from Disk test measures how long it takes the spreadsheet program to read the Mathematical Worksheet Recalculation test file from disk, using the product's native file format.



CONTINUES

Perhaps The Best Way To Choose A Spreadsheet Is By The Numbers.

its Ranking

PC WEEK/REVIEWS SCOREBOARD

Attributes	Barclay Quarter 1.01	CA SuperCalc5	Lotus 1-2-3 2.2	Lotus 1-2-3 3.0	Microsoft Excel 2.0	PS VP Planner Plus 2.0
Date integrity (1.00)	8	10	8	9	10	8
Ease of manipulating spreadsheet data (1.00)	7	9	8	10	8	8
Quality of documentation (1.00)	8	10	9	9	10	8
Performance relative to price (0.92)	10	7	7	6	7	9
Optimized RAM requirements (0.92)	9	10	10	5	6	10
Weighted Score	8.3	9.2	8.4	7.9	8.3	8.5

... in order of ...
... then

In a spreadsheet world filled with personal opinions, misleading claims, and advertising hype, you may want to consider what an objective third party has to say.

Like *PC Week*, who recently conducted a comparison of all the top spreadsheets and found SuperCalc®5 to be the best.

By far.

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Benchmark	Microsoft BASIC	Microsoft QuickBASIC	Borland [®] Turbo Pascal [®]
SAVAGE	129.1	449.9	281.0
FILE I/O	49.7	72.8	51.5
HAT	183.8	568.5	303.8
SCREEN	2.4	4.3	15.8
Matrix Ops	13.2	66.2	56.5
QuickSort	1.6	2.5	2.3
4P CALLS	0.3	1.0	0.6

Most Complete Set Of Tools For The Advanced BASIC Programmer.

- Microsoft QuickBASIC Extended environment for BASIC programming includes:

Full support for EMS 4.0 and multiple segments for storing variable length strings.

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- Microsoft Editor and CodeView[®] debugger allow mixed language and OS/2 programming.

EXCEL FOR OS 2



PERFORMANCE TESTS: COMPOSITE VIEW

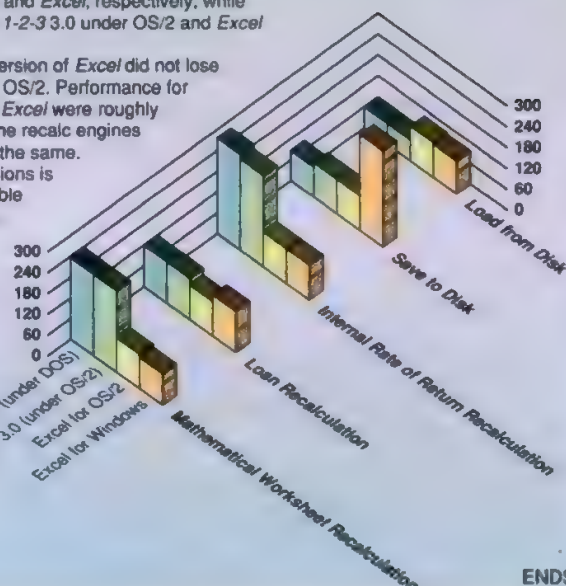
The PC Labs spreadsheet performance tests were performed on an IBM PS/2 Model 70-A21 (a 25-MHz 80386-based model) with an 80387 math coprocessor, 6MB of RAM, and a 120MB hard disk. DOS 3.3 and Microsoft Windows/386 2.1 were used to test the DOS versions of Lotus 1-2-3 and Excel, respectively, while OS/2 1.2 was used to test Lotus 1-2-3 3.0 under OS/2 and Excel for OS/2.

The Presentation Manager version of Excel did not lose out in the transition from DOS to OS/2. Performance for both Excel for Windows and PM Excel were roughly comparable, primarily because the recalc engines for both versions are essentially the same.

The efficiency of both Excel versions is greater than that of the comparable versions of Lotus 1-2-3, Release 3.0. Release 3.0 affords many more features than Release 2.01, but only at the expense of performance.

In the Save to Disk test, where the Windows version of Excel has typically been slower than 1-2-3, the PM version matched 1-2-3, Release 3.0, under OS/2. The highly interwoven relationship between OS/2 and PM accounts for this increased file-handling efficiency.

Relative Times
(Excel for OS/2 = 100)



than that offered by 1-2-3 3.0 (DOS or OS/2 versions). While OS/2 1.2's High Performance File System (HPFS) lets Excel for OS/2 take advantage of long, descriptive filenames, neither OS/2 spreadsheet was able to realize a gain when loading or saving the PC Labs benchmark test worksheets in an HPFS partition.

A LOOK AT THE FUTURE

PM Excel is indeed an impressive product, but some of the credit has to go to the OS/2 Presentation Manager. It is, simply put, an interface infinitely superior to Windows.

And while OS/2 pundits will probably prefer that Microsoft "violate" its standard of interoperability between versions of Excel in favor of speed gains, users of the Windows version are going to love the performance improvements implemented in PM Excel: consolidation, improved font support, and the ability to use their existing macros and knowledge of the interface. With DDE support already available, the combination of PM Excel and add-ins like Q+E will bring a smile to even the grouchiest of overworked computer users.

With few exceptions, PM Excel is an excellent model for future Presentation Manager applications. But if this is the first spreadsheet designed for PM, just imagine the level of software that will fill computer store shelves when programmers become old hands at designing for PM. The days of 15-product PM software roundups may well be just around the corner.

Richard Hale Shaw is a contributing editor of PC Magazine.



FACT FILE

Excel for OS/2

Microsoft Corp., One Microsoft Way, Redmond, WA 98052-6399; (800) 426-9400, (206) 882-8088.

List Price: \$495;

upgrade from Microsoft Windows version, \$50.

Requires: 80286-based AT or PS/2; 2.5MB RAM, hard disk; VGA, high-resolution EGA or IBM 8514/A graphics adapter; OS/2, Version 1.1 or later. 4MB RAM and Microsoft mouse or compatible recommended.

In Short: Excel for OS/2 is an uncompromising spreadsheet or business graphics program that is fully compatible with the OS/2 Presentation Manager. Support for 256 fonts, long filenames, a new "consolidation" capability, and complete compatibility with the Windows version make this a top spreadsheet program.

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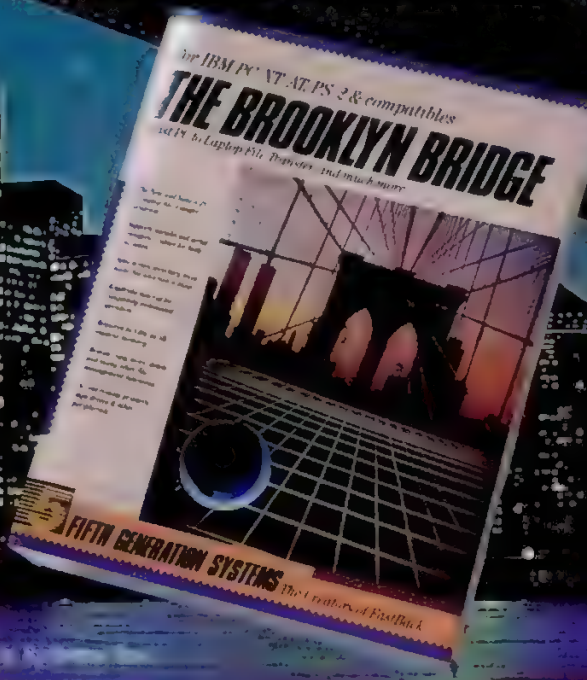
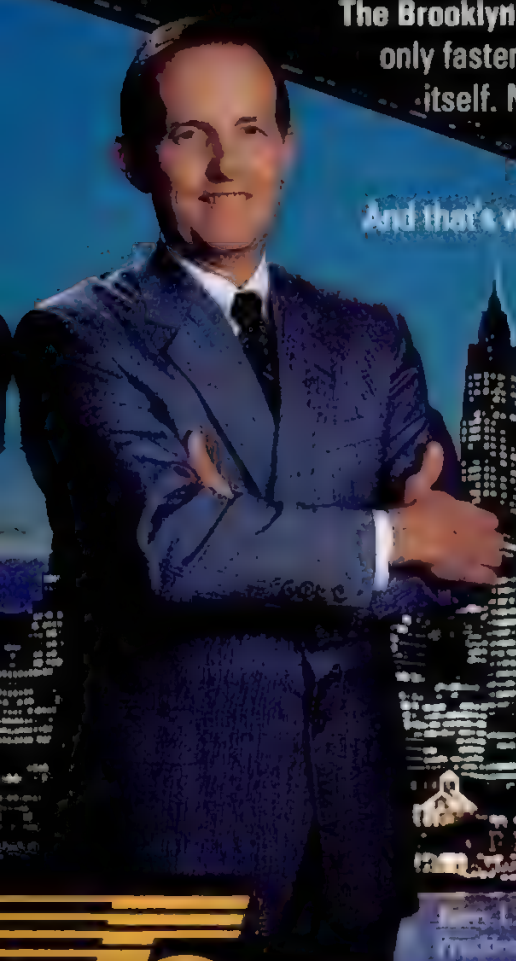
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Simultaneous access
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CD-ROM-based data

**is one of the greatest,
and latest, benefits of
networking. These six
systems help provide
that access—although
multiuse licensing for
some popular products
has yet to catch up
with the technology.**

by M. Keith Thompson and Kimberly Maxwell

Remember thumbing through several issues of *The Readers' Guide to Periodical Literature* looking for a topic, searching for the referenced magazine issues in the library stacks, and then slaving over hand-copied notes? If this is still your idea of doing research, you've never used a database published on CD-ROM.

Using technology adapted from CD audio technology, CD-ROMs let you do in minutes research that once took hours. A CD-ROM disk's small size and high capacity—up to 660MB—make the large databases contained on read-only compact disks very convenient to transport and update. And for a network, there are added benefits—simultaneous access to one or more CD-ROM-based databases, for example. Overall, there are few applications considered important enough by themselves to justify the installation of a LAN, but for many network managers, CD-ROM is one of them.

But therein lies a problem: CD-ROM devices and libraries for PCs, which hit the market in early 1986, typically are marketed and subsequently licensed as single-user systems. The idea is to put the CD-ROM drive on one PC and let one person use it at a time. This system is short-sighted, expensive, and a pretty inefficient use of a magnificent resource. The best way to use a CD-ROM is to put it on a network so that everyone can access it with economy and efficiency.

Some vendors have already begun to license their CD-ROM disks for network use. And the six products reviewed here—from Advanced Graphic Applications, Artisoft, CBIS, Fresh Technology Group, Hewlett-Packard Co., and Online Computer Systems—let your network reap the benefits of that liberty.

LIST OF TITLES GROWS

Get in touch with the Bureau of Electronic Publishing in Upper Montclair, New Jersey ((201) 857-4300), for a catalog featuring many of the approximately 250 CD-ROM database products currently available.

For the general market, you'll find *The New Electronic Encyclopedia* from Grolier Electronic Publishing and *Microsoft Bookshelf* (see "Archives in Miniature," *PC Magazine*, January 31, 1989). For the computer market, you'll find selections like *Microsoft Programmer's Library* and Ziff Communications Co.'s *Computer Library*; for general business, there's *Microsoft Stat Pak* and *Small Business Consultant*. Other databases available include the *Physician's Desk Reference* from Medical Economics, Lotus Development Corp.'s One Source product family, and NEC Home Electronics' image libraries, *Clip Art 3-D* and *Image Folio*.

A typical CD-ROM database package comes with database and retrieval software on the CD-ROM disk. The retrieval programs vary in their sophistication, but most allow database searches by keywords combined with and/or not logical conditions. This method helps your PC do a selective word search on an entire year's worth of computer-oriented publications or an entire encyclopedia within seconds.

The retrieval packages typically allow you to print out selections from the database or capture the information in a separate ASCII file. Since CD-ROM devices are read-only, the database retrieval software does not need sophisticated byte-range-locking capabilities to protect the

database from corruption while operating on a multiuser system.

THE LICENSING HITCH

The problem with loading application programs on a file server and sharing them with other users often isn't technical so much as legal. Many software companies still haven't determined how to price, distribute, or support multiuser versions of their software.

The legal problems loom much larger with CD-ROM databases. Unwilling to take the risk of compromising their profit margins, some companies have chosen not to allow legal multiuser access. Others have considered the idea and then stuck

Even those few
companies that believe
networking their
databases is a good
idea are in a quandary
as to how to price
and license the
multiuser versions.

their heads in the sand, hoping the problem would go away. Even those few companies that believe networking their databases to be a good idea are in a quandary as to how to price and license the multiuser versions.

The companies' reasoning deserves a close look. Publishers of CD-ROM databases tend to think of their products as reference books. One person at a time typically uses a reference book; if you want more copies, you pay the going rate. According to this line of thought, providing multiple simultaneous access to the same data is similar to making photocopies of a textbook—illegal and unfair.

Managers of computer systems, however, are used to getting a license for multiuser applications at discounted prices. Having to pay full retail price for each additional user also seems unfair.

Some publishers, like Microsoft, expect those using its databases to follow the honor system and report the number of people who access a CD-ROM disk at one time. The company charges an additional \$65 per node for multiple-workstation access in addition to the base price of each disk.

Microsoft also offers Academic Editions of its CD-ROM publications to accredited schools. *Microsoft Programmer's Library*, for example, sells for \$395 in the single-user version. If you want to provide five people with access to *Programmer's Library*, however, you pay \$395 for the *Programmer's Library* and \$260 for four additional access licenses (at \$65 each). Microsoft makes a 32-user Academic Edition of *Programmer's Library* available to qualified institutions for \$1,095. The 32-user Academic Edition of *Microsoft Bookshelf*, normally \$295 per node, sells for \$895.

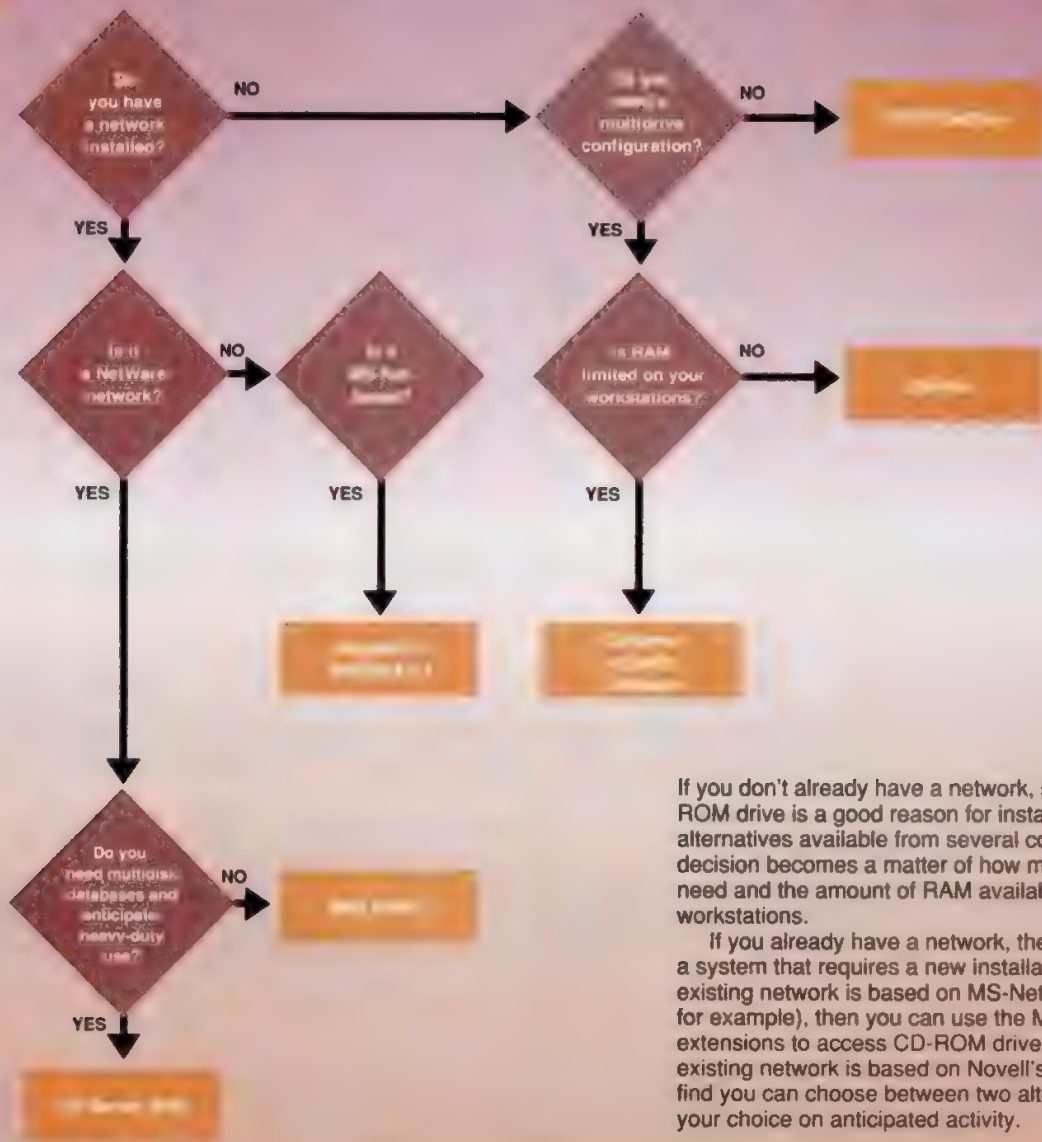
Ziff Communications, the publisher of *Computer Library*, provides workgroups with two different licensing options. In addition to the \$695-per-year subscription price, a fixed-station license costs \$120 per year and allows a specific computer to access the database. This approach helps organizations that want to provide access to *Computer Library* to many different users in one particular location, such as a corporate library or information center. A single-user license costs \$75 per year above the subscription price and allows an individual to access the database from any computer on the LAN; this includes dial-in remote access.

Still another option is offered by Online Computer Systems, the maker of *Opti-Net*. Online offers a network edition of Grolier's *New Electronic Encyclopedia* that allows simultaneous access to a pre-specified number of people. The *Opti-Net* software monitors the number of people using the data, and once you hit the limit, it refuses access until someone exits the application.

A spokesperson for McGraw-Hill Book Co., the publisher of the *CD-ROM Science and Technical Reference Set*, said it has no legal arrangement for multiuser access. The company, in other words, does not permit more than one workstation to access its CD-ROM database at a time.

The bottom line? You can't assume that there's a legal way to provide multiuser access to a database published on CD-ROM. It's logical, and it's technically possible, but that doesn't necessarily make it legal.

A DECISION GUIDE TO CD-ROM NETWORKING



If you don't already have a network, sharing a CD-ROM drive is a good reason for installing one. But with alternatives available from several companies, your decision becomes a matter of how many drives you need and the amount of RAM available in your workstations.

If you already have a network, then you don't want a system that requires a new installation. If your existing network is based on MS-Net (IBM's *PC LAN*, for example), then you can use the MS-DOS CD-ROM extensions to access CD-ROM drives. And if your existing network is based on Novell's *NetWare*, you'll find you can choose between two alternatives, basing your choice on anticipated activity.

CD-ROM EXTENSIONS

Once you've overcome the legal hurdles, the going often gets easier, although early pioneers in single-user CD-ROM—let alone the networked variety—had to overcome limitations that kept DOS itself from recognizing a CD-ROM drive. Some limitations are still being addressed.

DOS, after all, knows nothing about any storage device larger than 32MB. And a CD-ROM can store massive amounts of data—up to 660MB of information, with most commercially available databases ranging from 400MB to 550MB in size.

Clearly, CD-ROM engineers had to modify DOS to allow it to handle larger volumes.

The answer came from Microsoft in the form of a piece of software known as the Microsoft MS-DOS CD-ROM extensions, or MSCDEX. Most companies that sell controller cards for CD-ROM drives also license and distribute these extensions.

In addition, MS-DOS, Version 3.1 and later, offers a built-in network function. Despite MSCDEX, if you try to do a CHKDSK of a CD-ROM drive connected

to a standalone PC, you'll receive the reply "Cannot CHKDSK a Network drive" despite your standalone status. DOS returns this error message because, to the operating system, the CD-ROM drive on a standalone PC *looks* like a network drive. For this reason, normal networking software can't make it available to the network without intervening software.

MSCDEX and DOS's network function work together when the CD-ROM drive actually is part of a network. When an application program requests data contained on what is recognized as a network

drive, the request comes to the network redirector software, either directly or via DOS. The redirector then sends the request over the network to the appropriate server.

MSCDEX assigns drive letters to the CD-ROM devices, translates between the disk storage format DOS expects to see and the CD-ROM disk, and controls the drive. If a company doesn't use the Microsoft CD-ROM extensions, it must provide its own software to do the same job.

Another complexity unaddressed by the Microsoft CD-ROM extensions arises from the way CD-ROM database retrieval software employs temporary files. Because CD-ROM systems are slow, retrieval programs use temporary files to store data gleaned from recent searches and database index files.

But the authors of these retrieval programs did not uniformly consider multiuser access; consequently, these applications create temporary files with the same name each time the program runs. When you load these programs on a network, you must create a separate subdirectory for each workstation that's running a copy of the retrieval software. Each person must run this software from a separate subdirectory or local disk drive, which provides a place to write each user's temporary files.

You must also decide if users will get faster service by putting the temporary files on the file server or on their own local hard disk drive. All of these factors can significantly complicate the installation and maintenance of CD-ROM systems on a network.

CONFIGURING HARDWARE

Whether you want to install a CD-ROM drive on an existing network or install a network that will include CD-ROM data-sharing capability, you'll be facing certain decisions about the hardware configuration you plan to use. Here are some of your considerations.

First of all, a networked CD-ROM system must include a CD-ROM drive controller card, the CD-ROM drive or drives themselves, and a complete PC specially configured—and sometimes dedicated—for use as a CD-ROM server.

Aside from the network interface card, the only piece of hardware that you add inside the PC acting as a network CD-ROM server is a CD-ROM drive controller card. Some manufacturers offer controllers that use a proprietary cable and signaling scheme between the drive and the controller. The benefit of the proprietary control-

ler is that it optimizes the flow of data from the drive to the RAM.

Others, however, offer controllers using Small Computer System Interface (SCSI) connections. Almost all of these schemes use a daisy chain for the data bus, so adding drives is usually just a matter of chaining them in with one more piece of cable. In fact, the architecture of the SCSI adapters allows you to use any drive with



connections that meet the SCSI standard. In theory, you can also daisy-chain other SCSI-compatible devices, like hard disk drives or tape backup units, to the one SCSI controller card. In practice, however, you won't be likely to do this because you'd need specially configured driver software, but it is possible to use this ability to help slot-starved PCs.

If you use a proprietary controller, you'll have to take whatever kind of drive the manufacturer offers with it. Hewlett-Packard, for example, markets its own controller and a drive manufactured by LMSI-Philips. This unit looks like a 5.25-inch, half-height hard disk and fits into the same mounting slots or rails used for a hard disk. It draws less than 1 amp of 5-volt and 12-volt power from the host PC.

Sony CD players are widely used in the audio industry, so it isn't surprising that many of them turn up in data service, as well. They are typically packaged in their own low-profile cabinet with a power supply, fan, and data cables. There are several models of the Sony cabinet-mounted drives available; some use Sony's proprietary cabling system, some use SCSI ca-

bling, and some use both. To complicate things further, some models also sport an audio interface—so when you aren't using them for data, you can load controlling software into the PC and use these drives to play audio disks.

But regardless of the kind of interface used to connect a CD-ROM drive to a PC, it takes a long time to retrieve the data. The access times for CD-ROM drives—the time needed for the electromechanical arm to move to the correct area and read the data—are slow compared with hard disks. The drives on the market today, after all, merely use an adaptation of the drive mechanisms used in CD audio players. For audio, providing fast access to the data on the disk was never a design consideration.

Most CD-ROM drives have access times ranging from 400 milliseconds to 800 ms.; in comparison, the old IBM PC-XT floppy disk drives have an access time of 500 ms. The fastest CD-ROM drive we found listed is made by Denon and has a rated access time of 300 ms.; the Toshiba drives used in CBIS's CD Server are rated at 400 ms. (Today, hard disks have access times in the 11- to 85-ms. range.)

If the response time of today's CD-ROM hardware is too slow for your applications, there are two ways to speed up the operation. Both, however, involve an additional investment. First, you can add many megabytes of memory to the CD-ROM server for use as a cache memory. While this doesn't quicken the first database inquiry, on subsequent queries the retrieval speed can be very fast if the query is satisfied from the data preloaded into the cache.

Your ability to use the second method of speeding up responses will depend on how much data is contained on your CD-ROM and how much money you are willing to spend. If the database is 300MB or so, it might be practical to buy a large hard disk drive, download the contents of the CD-ROM disk to the hard disk, and use the drive as a standard file server. Many LAN operating systems have limitations on the maximum size of a contiguous hard drive they can service, but those limitations should disappear under *NetWare 386*, the various releases of *3+Open LAN Manager*, and file services for MS-DOS-based PCs running on minicomputers marketed by companies like AT&T, DEC, and Hewlett-Packard. If you load the data on a big, fast hard drive, in other words, the data will travel out to networked PCs very quickly.

CD-ROM SERVERS: A TOPOLOGY

While the products that create a CD-ROM server on a network vary in their options and the hardware they include, they follow the same pattern. Each network workstation runs the CD-ROM database query software and uses either NetBIOS or IPX network transport software to move requests and data across the network. The same client stations might also run the Microsoft CD-ROM extensions with some multiuser CD-ROM products. The PC acting as a CD-ROM server runs the extensions or equivalent software; it also runs networking software that makes the CD-ROM drive available to the network.

Shared CD-ROM drive(s)

CD-ROM controller card

Network file/print server

Shared hard disk(s)

Printer cable

Network client stations running

- DOS
- IPX or NetBIOS
- LAN redirector software
- CD-ROM search software

CD-ROM server running

- DOS
- IPX or NetBIOS
- LAN device-sharing software
- Microsoft CD-ROM extensions or equivalent

Network cable

Shared printer

On a network, you should consider installing multidrive units, such as Online Computer Systems' four-drive-capacity unit. This stack of CD-ROM drives is useful when people need access to a single database stored on several disks, or when network users need access to different databases at the same time.

Because these drives use a laser to read the optical disk, dust and heat are their mortal enemies. Cigarette smoke and other kinds of pollution can slow the access time of the drive because they obscure the data and force the system to retry many times. Making frequent retries heats the laser lens, and if the drive doesn't have adequate ventilation, the lens will melt. In other words, banning smoking and ensuring adequate cooling make good sense.

CD-ROM, MEET THE NETWORK

Generally, the CD-ROM server is a 286- or 386-based computer dedicated to serv-

ing network users. Its main qualifications: plenty of space to hold a stack of CD-ROM drives and lots of memory. One complete CD-ROM solution, CBIS's CD Server, includes a 12-MHz 286 PC configured to carry multiple CD-ROM drives on NetWare and NetBIOS networks.

This PC can perform other duties on the network; it can, for example, act as a tape backup and communications server when it isn't performing its CD-ROM server functions. But because CD-ROM drives are so slow, you probably won't want interrupts from these additional services further slowing delivery of data from the CD-ROM drive.

You can integrate a CD-ROM system into a network in several different ways. The reviews in this issue describe products, like *Map Assist*, that are only software (you provide the CD-ROM hardware), combination hardware/software systems for existing networks (for exam-

ple, Online Computer Systems' *Opti-Net* and accompanying drive), and complete networks with built-in CD-ROM support, like Artisoft's *LANtastic* system. Overall, all systems reviewed had to allow shared access to any vendor's CD-ROM-based data; this excluded Lotus Development's own proprietary system, which can access only products from the company's One Source family.

One major CD-ROM integration package not reviewed in this issue is *CD-Net*, marketed by Meridian Data. *CD-Net* was one of the first such products on the market, and the company plans to release an updated product that was not ready by our review deadline.

PC LAN Labs found that integrating CD-ROM support into the network software is the best solution, and apparently Microsoft thought the same thing. With its latest release of the CD-ROM extensions for MS-DOS, the company added support

CD-ROM: WHAT'S OUT THERE

by Wendy Murch

Perhaps you're new to CD-ROM and aren't yet sure what's out there. If so, here's a roundup of some of the hotter titles available, several of which we reviewed in "Archives in Miniature" (*PC Magazine*, January 31, 1989). Be sure to research licensing arrangements before investing.

- *CD-ROM Science and Technical Reference Set*, McGraw-Hill Book Co., (800) 2MC-GRAW; \$300. McGraw-Hill's *Concise Encyclopedia of Science & Technology and Dictionary of Scientific and Technical Terms*.
- *Clip Art 3-D*, NEC Home Electronics, (312) 860-9500; \$399. More than 1,000 3-D graphical images.
- *Computer Library*, Ziff Communications Co., (212) 503-4400; \$695. Full text from 10 computer magazines and abstracts from 120 related electronics and business periodicals.
- *Lotus One Source*, Lotus Development Corp., (617) 577-8500; \$7,000 to \$20,000. Five core products that access and analyze over 20 financial and corporate on-line databases. Periodic updates according to package.
- *Microsoft Bookshelf*, Microsoft Corp., (206) 882-8080; \$295. Aptly

named, this disk includes dictionary, thesaurus, almanac, ZIP code directory, and more.

- *Microsoft Programmer's Library*; \$395. Text from 72 manuals covering 11 programming languages and operating systems. Also includes 26MB of sample code.
- *The New Electronic Encyclopedia*, Grolier Electronic Publishing, (800) 356-5590; \$395. Full text of Grolier's *Academic American Encyclopedia* minus graphics. 30,000 articles in all.
- *The Original Oxford English Dictionary on Compact Disk*, Oxford University Press, (800) 334-4249; \$950. The original 12 volumes on a single disk.
- *PC-SIG Library*, PC-SIG, (408) 730-9291; \$495. A complete library of public-domain software—the equivalent of over 1,240 floppies.
- *Physician's Desk Reference*, Medical Economics, (201) 262-3030; \$595. Every fact from the *Physician's Desk Reference*, the *PDR for Non-Prescription Drugs*, and the *PDR for Ophthalmologists*.
- *The Readers' Guide to Periodical Literature*, H. W. Wilson, (800) 622-4002, (212) 588-8400; \$1,095. No more searching in dusty volumes. ■

for MS-NET-based networks by providing an /S switch to the command-line options for the extensions. These networks can subsequently offer CD-ROM support without requiring the use of any special LAN software.

In theory, this should work for all MS-NET-based networks—the prime example being IBM's *PC LAN*—but we recommend contacting the LAN vendor you select for confirmation before purchasing. We do know that Hewlett-Packard's *HP OfficeShare* works with the new Microsoft CD-ROM extensions through the /S command.

One complete network system, *LANtastic*, provides CD-ROM support by not making any assumptions about the media on which the data is stored and by using standard DOS calls to access the drives. Other network vendors have written special drivers for talking to CD-ROM drives

and included them in their products; CBIS for example, has done exactly this with *Network OS*.

Of course, any requirement for a CD-ROM system, networked or standalone, is primarily a need for the information contained in a database published on a CD-ROM disk. Thanks to the sponsorship of companies like Microsoft and the aggressive action of other vendors, CD-ROM publishing is taking off. Raw and processed information and graphical images of all kinds are coming to the market through this medium.

CD-ROM publishing and CD-ROM sharing are two young technologies that can benefit from grass-roots support. If the database you need isn't on CD-ROM already, ask the publisher for it. If it's on CD-ROM but the publisher doesn't have a multiuser license, press the issue. Networked CD-ROM databases can im-

prove the productivity of many kinds of organizations. This is easy-to-use technology with plenty to offer—given the freedom.

ADVANCED GRAPHIC APPLICATIONS INC.

AGANET

by M. Keith Thompson

AGANET, Advanced Graphic Applications' CD-ROM integration system for NetBIOS—though not Novell's version—creates a CD-ROM server that provides fast access to CD-ROM databases. The \$800 system consists of a custom SCSI interface card and a software patch for DOS called *Discus*; you supply the CD-ROM drive.

Be warned: the AGANET system doesn't just fall into place. You have to pay attention to detail and learn about a few new pieces of software to install and use the system. The most unusual setup requirement is having to tell the software

You have to learn
about a few new pieces
of software to install
and use the system.

how many files are on the largest CD-ROM database disk you intend to use. Also, the software requires extended memory to run.

On the hardware side, the AGANET SCSI adapter card comes with defaults assigned for interrupt and memory requirements. Your job is to ensure that these assignments don't interfere with other devices in your computer.

PATCHING UP DOS

The *Discus* software includes patches and utilities for integrating and managing CD-ROM drives on the network. These programs are *DOSPATCH*, *CHKCD*, *CDERROR*, and *CDSHB.SYS*.

DOSPATCH, as the name implies, patches DOS to permit it to use a larger sector size. The normal DOS sector size

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To order CD Net and get your disc rolling, call Candace Brown, network sales manager, at (408) 438-3100.

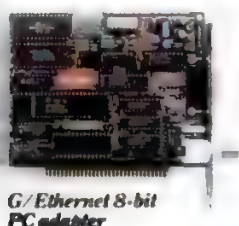


CIRCLE 134 ON READER SERVICE CARD

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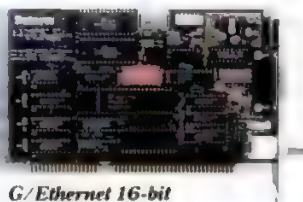
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Advanced Graphic Applications' AGANET (\$800) consists of a custom SCSI interface card and the software patch *Discus*. Installation requires an attention to detail that often must be left to qualified dealers.

(512 bytes) allows a maximum disk size of 32MB—far short of the 660MB maximum of a CD-ROM disk. *DOSPATCH* changes some values in the hidden system file *IBMDOS.SYS* (*MSDOS.SYS* for MS-DOS-based computers) present on every boot disk or volume. Unfortunately, the modified hidden files render AGANET incompatible with Novell's *NetWare* because of a conflict with *NetWare*'s shell drivers. In effect, *DOSPATCH* is a substitute for the Microsoft CD-ROM extensions to DOS used in other CD-ROM systems. But the standard Microsoft extensions do not impair Novell compati-

AGANET
Advanced Graphic Applications Inc., 90 Fifth Ave., New York, NY 10011-7696; (800) DISCUS-1, (212) 337-4200
List Price: With custom SCSI card and *Discus* software, \$800
Requires: 80286- or 80386-based computer, 64K RAM, (1MB extended memory recommended), SCSI-based CD-ROM drive, NetBIOS-compatible network, DOS 3.0 or later
In Short: AGANET performs well and rated best on PC LAN Labs' performance tests, but incompatibility with Novell's *NetWare* limits its attraction. It also requires a relatively high level of technical sophistication on the part of the installer.

CIRCLE 421 ON READER SERVICE CARD

CONNECTIVITY NETWORKING CD-ROMs

bility as does *DOSPATCH*.

CHKCD provides the same functionality as the DOS *CHKDSK* program for the CD-ROM device: it tells you how many files are on the disk and how much disk space the files use.

CDERROR reports the nature of a DOS General Failure error when reading the CD-ROM. System managers will find this handy for troubleshooting, since running this program gives you the last error type received, no matter when the error was made.

CDSHB.SYS, the 40K device driver for the AGANET SCSI interface card, runs on the CD-ROM server and grants users access to the CD-ROM drives. The company recommends dedicating the CD-ROM server to the task in light of memory requirements and performance considerations. Not much memory remains for running application programs, and workgroup users will retrieve their data faster.

CDSHB.SYS needs to know how many files are on the CD-ROM disk to determine how many buffers it should establish. While this feature improves response time, it makes the AGANET package more difficult to install. You must take the time to *CHKCD* each disk and see which one contains the most files. You then include this information on the command line when loading the device driver in your *CONFIG.SYS* file.

NO BUFFERING IN EMS

AGANET supports only extended memory for disk buffering and will not use expanded memory. To further complicate things, the company requires that you inform *CDSHB.SYS* of an address in extended memory where you want the buffering to begin. This can be difficult, especially if you have other programs that use extended memory and don't know their memory addresses or how much memory they use. This need for extended memory demonstrates the degree of expertise needed to set up the AGANET system.

Once the driver software loads, AGANET works without a hitch. You simply load your network software and make the CD-ROM a shared resource. The data-retrieval programs running on the network stations access the CD-ROM as they would any other drive on the network.

AGANET works well on NetBIOS-compatible networks. The lack of compatibility with Novell's *NetWare*, howev-

er, limits the product's market. The fast access this system provides to the CD-ROM drive does outweigh the complexity of the setup process, but anyone who isn't comfortable with the details of extended memory and system interrupts should rely on a qualified dealer for installation.

ARTISOFT INC.

LANtastic

by M. Keith Thompson and Kimberly Maxwell

Artisoft includes CD-ROM support as a standard part of its network operating system, *LANtastic*. Selected as an Editor's Choice in our last review of low-cost LANs (see "Building Workgroup Solutions: Low-Cost LANs," *PC Magazine*, March 28, 1989), the system offers full networking capability by sharing both a hard disk and a printer through specialized network interface cards, and it also includes a built-in capability for sharing CD-ROM drives across the network. If you

Artisoft's *LANtastic* offers full networking capability by sharing both a hard disk and a printer through specialized network interface cards.

don't already have a network established, *LANtastic* is an excellent alternative for CD-ROM sharing.

By including the ability to address the Microsoft CD-ROM extensions in the *LANtastic* operating system, Artisoft provides the cleanest integration possible for CD-ROMs in a network. Under *LANtastic*, you run the Microsoft CD-ROM extensions only on the server—not on each workstation.

The system makes no assumptions about the data-storage devices (for example, hard disks, tape drives, or CD-ROMs)

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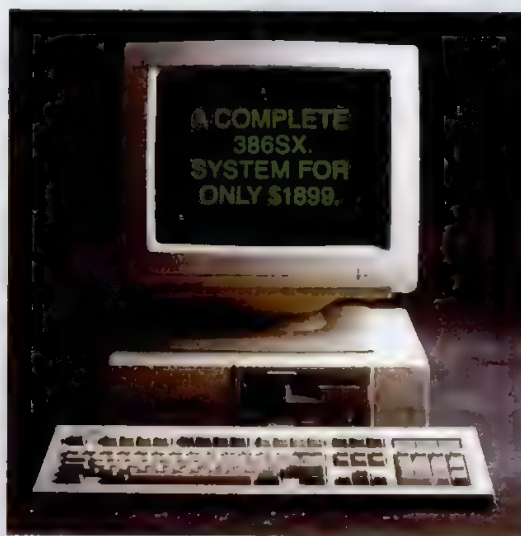
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CONCEPT NETWORKING CD-ROM



Artisoft's \$525 LANtastic starter kit includes a built-in capability for sharing CD-ROM drives across the network. The starter kit consists of software and interface cards for two workstations, plus cabling.

the operating system will manage. LANtastic uses standard DOS calls (Int 21) to access the storage device, but the operating system was written with the ability to pass calls to the Microsoft CD-ROM extensions on the server.

USES NONDEDICATED SERVER

Artisoft's menu-driven installation program copies the files from the distribution disk to the proper directory structure. Your next step is to install a CD-ROM drive with the proper device driver and a copy of the Microsoft CD-ROM extensions, supplied by the drive manufacturer, on the PC that will be the CD-ROM server. Fortunately, the PC does not have to be dedicat-

ed to the task. As the device driver loads, the next available logical drive letters are assigned to the CD-ROM drives.

After installing LANtastic, the program's menu lets you initiate an automatic broadcast to the network, which tells each station which drive letter is assigned to the CD-ROM device driver. You then assign a network share name to the shared resource and inform LANtastic that the resource is a CD-ROM drive, after which the operating system channels access requests it receives from application programs to the Microsoft CD-ROM extensions. LANtastic also supports multiple CD-ROM drives by letting you give each drive a different network share name.

When you want to access a particular drive on a CD-ROM server, you have LANtastic link one of your unused drive letters to the named server and drive. In other words, if you want your D: drive mapped to a drive named DATABASE on the CD-ROM server named CDSEVER, you enter the command NET USE D: \\CDSEVER\\DATABASE on the DOS command line. The networking software makes the link and directs the database retrieval software to your D: drive to find its data.

BENEFITS FROM LARGE CACHE

As with all network systems, LANtastic provides faster CD-ROM service, at least on repeat queries, if you outfit the CD-ROM server with a large disk cache. LANtastic does not come with a disk cache utility, but you'll find it compatible with the utilities reviewed in "Getting the Most Out of Memory," (PC Magazine, February 14, 1989). Even without caching software installed, however, LANtastic gave reasonably fast responses to single and multiple databases.

Our test bed configuration—a PC workstation ready to use any network feature, including a CD-ROM server—lost only 11K of RAM after we loaded all the necessary software. The network software on the CD-ROM server occupied a more substantial 42K of RAM.

In addition, LANtastic offers multiple levels of security for all printers, disk drives, or any other resources that can be used on the network. In order to control access to the CD-ROM drive, the system administrator creates special group names for users needing access.

Installing a LANtastic network for CD-

ROM service is practical if you don't already have a network installed. The comparative cost may initially seem high because you have to buy the complete network—including the interface cards, cables, and software—but for the price, you get full networking capabilities plus CD-ROM service.

CBIS INC.

CD Server

by M. Keith Thompson

CD Server from CBIS offers large workgroups fast access to multiple databases, connecting as many as 14 CD-ROM drives to one dedicated server. It's available in two versions: one for CBIS's Network OS LAN operating system and one for Novell's NetWare using Novell's NetBIOS emulation. The \$5,300 price includes a complete 12-MHz, 80286-based PC with one Toshiba CD-ROM drive, the Microsoft CD-ROM extensions, and other integrating software.

CD Server connects to the network through any of the many LAN interface cards supported by both operating systems, so it will run equally well on Ethernet, ARCnet, Token-Ring, and other network systems. In fact, you can have 255 servers, each containing 7 CD-ROM drives, on a Novell network and up to 21 drives (and any combination of servers) on any one Network OS network.

The CD-ROM server is dedicated to the job and cannot run other applications while it is in that role. But since the computer is a DOS machine, it can act as a workstation or tape backup station whenever it isn't doing CD-ROM server chores.

EDITOR'S CHOICE

LANtastic
Artisoft Inc., Artisoft Plaza, 575 E. River Rd., Tucson, AZ 85704; (602) 293-6363.
List Price: LANtastic starter kit (two 2Mbps adapter cards, NOS network license, 15-foot cable and terminators), \$525; additional 2Mbps cards, \$249; adapter-independent NOS, \$495.
Requires: 40K RAM on server, 12K RAM on workstation, CD-ROM drive with controller, MSCDEX, DOS 3.1 or later.
In Short: A great solution for users without an existing LAN, this versatile network is easy to use and gives workstations simultaneous access to multiple drives. The operating system's built-in compatibility with MSCDEX offers the cleanest network integration possible.

CIRCLE 422 ON READER SERVICE CARD

EDITOR'S CHOICE

CD Server
CBIS Inc., 5875 Peachtree Industrial Blvd., Bldg. 100, #170, Norcross, GA 30092; (404) 446-1332.
List Price: With 12-MHz 80286-based PC, Toshiba CD-ROM drive, MSCDEX and other software, \$5,300.
Requires: 1MB extended memory per user, Network OS, NetWare 2.15 with NetBIOS, or NetBIOS-compatible LAN.
In Short: This industrial-grade solution to CD-ROM networking is easy to install and works well for large numbers of people across a variety of network interfaces.

CIRCLE 423 ON READER SERVICE CARD



NETWORKING CD-ROMs: SUMMARY OF FEATURES

(Products listed alphabetically by company name)

The following commentary analyzes some of the terms and phrases in this table of features. The phrases in **bold** are listed in the same order as in the left-hand column of the table.

Product includes When you add CD-ROM capability to an existing LAN or build a LAN with CD-ROM functionality, the system includes at least one PC acting as a CD-ROM server, a CD-ROM drive with controller card, cabling, the Microsoft CD-ROM extensions to MS-DOS (MSCDEX) or equivalent, and LAN device-sharing software, as well as the network's standard operating system, redirector software, and interface cards. The products listed here provide various parts of the whole.

Server must be dedicated A software product enabling CD-ROM data sharing may require that the PC designated as the network's CD-ROM server be dedicated—that is, performing no functions other than managing data requests for users on the network. But even if a package allows use of a nondedicated server, you can often count on a significant performance lag in a CD-ROM server that is also being used as a workstation.

Server monitors CD-ROM drive status Some products reviewed here display a drive status report on the CD-ROM server's monitor. This report details such items as which users are accessing the CD-ROM-based data and, in the case of units with multidisk capacity or multiple drives, which disk is being accessed by whom.

Type of interface to CD-ROM drive Vendors primarily use either Small Computer System Interface (SCSI) connections or their own

proprietary format to connect a CD-ROM drive with its host computer. Generally, SCSI schemes let you daisy-chain CD-ROM drives with additional cables; this saves slot space. Proprietary signalling schemes may improve the flow of data from the drive to system RAM, although you must then use only CD-ROM drives that the vendor markets.

Server/Workstations require(s) MSCDEX The Microsoft extensions cleanly modify DOS to allow it to address a storage device larger than 32MB—in this case, as large as 660MB. While MSCDEX or an equivalent must be run in the network's CD-ROM server and often in each workstation accessing the drive, a workstation will require 23K less RAM if only the CD-ROM server needs MSCDEX in memory.

Disk caching With the fastest CD-ROM drives clocking in at 300 milliseconds (compared with the 11- to 85-ms. range of hard disks), caching—through the software provided or through a third-party product—is the best way to speed data access. Before selecting a system, however, you must ascertain that your designated CD-ROM server and your workstations have been configured with the type and amount of memory required by the system.

Network compatibility NetBIOS compatibility provides the CD-ROM networking software with easy connections to NetBIOS versions from several different companies, including IBM Corp. and Novell. If a product listed is compatible with the IPX protocol of Novell's NetWare, it will be compatible with NetWare only.

	Advanced Graphic Applications Inc. AGANET \$800	Artisoft Inc. LANtastic \$399	CBIS Inc. CD Server \$5,300	Fresh Technology Group Map Assist \$249	Hewlett-Packard Co. HP OfficeShare \$3,090	Online Computer Systems Inc. Opti-Net \$4,395
List price						
Product includes	Custom SCSI card, Discus	Starter kit: 2 adapter cards, 2-user version of LANtastic, cable, terminators	12-MHz 286-based PC, Toshiba CD-ROM drive, MSCDEX, other software	1-server software license	Server software for 10 users, CD-ROM drive with controller card, MSCDEX	4-disk-capacity CD-ROM drive and controller, 100-user version of Opti-Net, cable, MSCDEX

CD-ROM SERVER

Server must be dedicated	☐	☐	☒	☐	☐	☐
Maximum number of drives each server can manage	7	32	14	1	4	24
Server monitors CD-ROM drive status	☐	☐	☒	☐	☒	☒
Type of interface to CD-ROM drive:						
SCSI	☒	N/A	☒	N/A	☐	☐
Proprietary	☐	N/A	☐	N/A	☒	☒
Server requires MSCDEX	☐	☒	☒	☒	☒	☒
Workstations require MSCDEX	☐	☐	☐	☐	☐	☒

DISK CACHING

Caching in expanded memory	☐	☐	☐	☐	☐	☐
Caching in extended memory	☒	☐	☒	☐	☐	☒
Caching in conventional memory	☐	☐	☒	☐	☒	☒

NETWORK COMPATIBILITY

NetWare (using IPX)	☐	☐	☒	☒	☐	☐
NetBIOS-compatible networks	☒	☒	☒	☐	☒	☒

—Editor's Choice ☒—Yes ☐—No

N/A—Not applicable: this product does not include a CD-ROM drive or adapter.

COMPLETE PACKAGE

The computer CBIS provides comes with 640K of conventional RAM and 1.4MB of extended memory, a 1.2MB floppy disk drive, and a keyboard. A CD-ROM drive and SCSI adapter round out the hardware end of the CD Server package.

On top of that, the company recommends that you install 2MB of extended memory for each user accessing the drive—up to the 16MB limit of the processor. The server software uses this memory as a cache to keep the most recently requested data in RAM for faster secondary recall. If you apply this formula, each server can handle only eight workstations, but these conservative estimates are based on heavy and simultaneous usage by all eight computers.

You install and set up CD Server through a simple menu-driven program called CDCONFIG. This program uses screen prompts to ask for information like the server name, the number of users, and the number of files opened by each workstation. After you've answered these questions, CDCONFIG creates a boot disk for the selected system.

The CD Server's monitor screen provides system managers with information on how people use the system. The screen displays the DOS drive letters assigned to the CD-ROM drives and information about what servers the drives are on, the number of active users, and disk changes.

Each *NetWare* OS workstation uses 48K of RAM for network overhead and only 2K for running the CD-ROM drive it-



self. On *NetWare* workstations, CBIS requires 23K to allow *NetWare* to access the CD-ROM drive; this is in addition to the memory *NetWare* uses.

CD Server provides *NetWare* workgroup users with a fast way to integrate CD-ROM capability, and existing *NetWare* OS installations need only buy the CD Server. The greatest benefits of this system will go to large workgroups needing to access multiple databases.

FRESH TECHNOLOGY GROUP

Map Assist

by M. Keith Thompson and
Kimberly Maxwell

Fresh Technology Group's new program, *Map Assist*, allows any PC on a Novell network to make drives, printers, and other attached resources available to any other PCs on the network. We looked at *Map Assist* as a way to access CD-ROM devices, but we found that it allows you to share other resources, too. The software's ease of use, small RAM requirements, and low cost (\$249 per server) make *Map Assist* an excellent solution for people with *NetWare* LANs who want to add a shared CD-ROM drive for infrequent use.

The installation of *Map Assist* isn't complicated; you simply make a directory and copy the files from the *Map Assist* disk to the hard disk of the PC designated to act as a CD-ROM server. And if you have a CD-ROM drive, the appropriate device driver for the CD-ROM interface card, and the Microsoft CD-ROM extensions, the system requires no other setup.

TWO-PROGRAM PACKAGE

Map Assist consists of two programs: one for the CD-ROM server called MAR.COM and one for the workstations called MA.COM. The MAR.COM program, a 6K module, runs only on the server PC and allows LAN users to access the CD-ROM drive.

MAR.COM controls access to the CD-ROM. Its options describe what resource MAR.COM will share, who can access the resource, and what rights they have. *Map Assist* tightly integrates with Novell's *NetWare* and uses *NetWare*'s structure for naming people and workgroups on the network and for assigning access rights.



The link between *Map Assist* and *NetWare*'s group names provides the first level of security for the shared device. However, in a situation where only one person needs high-speed access to the CD-ROM drive, you can grant that person exclusive use of the drive through MAR.COM instead of by changing your *NetWare* configuration. You can also easily disable exclusive access to ensure that no one is unnecessarily locked out of the drive.

MA.COM runs on every network workstation, where it takes up 7K of RAM and *maps*, or redirects, a workstation's local drive designation to the server's CD-ROM. In this way, the query software running on a station can address the CD-ROM



CBIS's CD Server (\$5,300), the only complete system reviewed, includes a 286/12 PC with 2MB RAM, a Toshiba CD-ROM drive, the Microsoft CD-ROM extensions, and other integrating software.



CIRCLE 434 ON READER SERVICE CARD

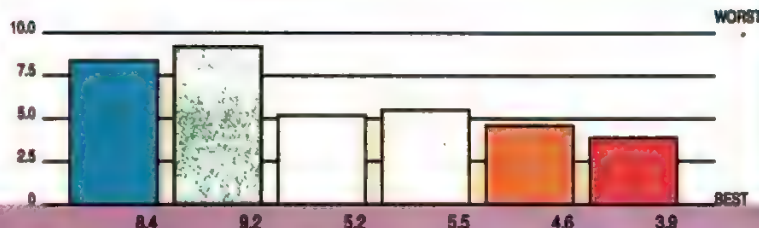


PERFORMANCE TESTS: CD-ROM NETWORKING

CD-ROM DATABASE SEARCH

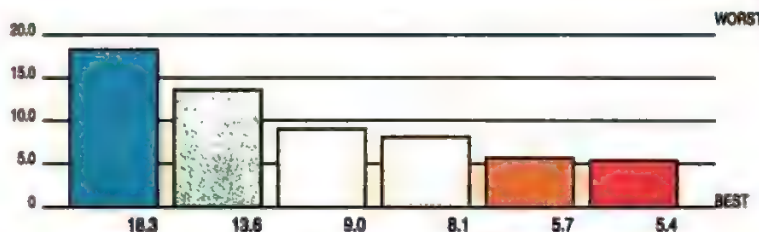
One Station

Elapsed Time (seconds)



Two Stations

Elapsed Time (seconds)



Three Stations

Elapsed Time (seconds)



Product name /
NetBIOS operating
system

Map Assist Novell
CD Server Novell
HP OfficeShare Hewlett-Packard
LANtastic Arisnet LANtastic
Opti-Net Novell
AGANET Arisnet LANtastic

PC LAN Labs' performance tests demonstrate how CD-ROM devices, when networked, show major speed differences even when executing retrieval requests from a single workstation. These differences become greater when several stations make simultaneous requests. Downloading the database to a large hard disk, however, would give retrieval times close to 1 second.

The CD-ROM Database Search test results show the elapsed time required to conduct a multiword search in Microsoft Programmer's Library's CD-ROM database. Multiple requests are made simultaneously, and the results show the time required to complete all requests.

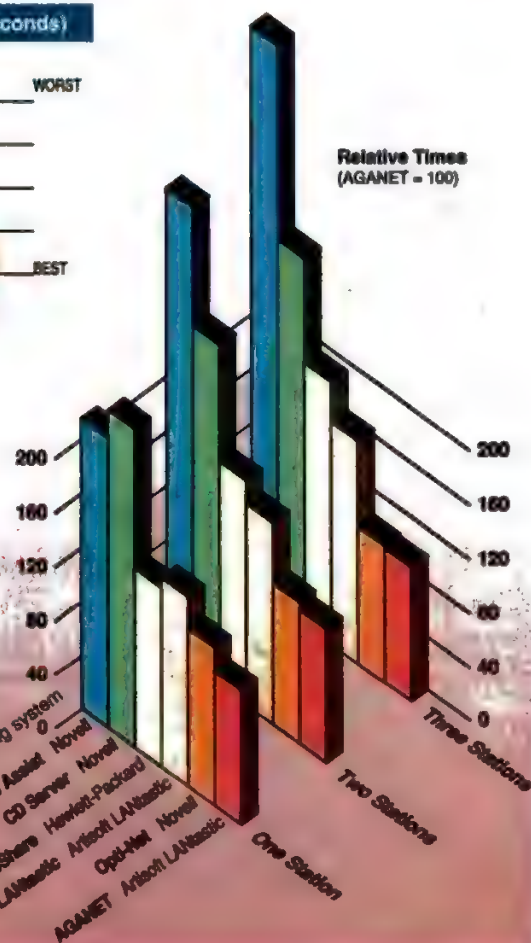


CD-ROM NETWORKING PERFORMANCE TESTS: COMPOSITE VIEW

PC LAN Labs' tests of CD-ROM systems' performance in a networked capacity demonstrate that factors like CD-ROM seek time affect access speed more than network delay does. Putting a CD-ROM drive on a network theoretically would have little impact on single-station information retrieval times, but as the number of simultaneous requests goes up, multiuser contention drags down database access times.

Map Assist's slow retrieval times result from the way this low-cost program queues requests and handles one at a time. While that approach is adequate for single-station use, multistation test results show Map Assist to be most practical in environments with infrequent, casual database requests.

AGANET posted the fastest times, but keep in mind that its modification of DOS's hidden files holds potential compatibility problems, most notably with Novell's NetBIOS. Opti-Net's runner-up speeds are due to its disk caching and the somewhat faster CD-ROM drives included in the system.



Product name / NetBIOS operating system
Map Assist Novell
CD Server Novell
HP OfficeShare Hewlett-Packard
LANtastic Arisnet LANtastic
Opti-Net Novell
AGANET Arisnet LANtastic

SAMSUNG/NOVELL

PCterminal/286

SAMSUNG/NOVELL

PCterminal/286



SAMSUNG/NOVELL

PCterminal/286



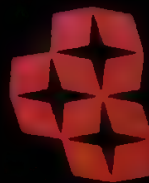
SAMSU

PCterminal/



SAMSUNG/NOVELL

PCterminal/286



SAMSU

386AE FILE S

How to plan your LAN.

You'll need a pencil.

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And you can plan on 100 percent compatibility with all versions of Novell's NetWare[®], because Samsung's LAN hardware was co-designed by Novell. Just like the label says.

THE TESTING WENT IN BEFORE THE LABEL WENT ON.

Both the Samsung 386AE and PCterminal/286 have

been tested exhaustively and certified by Novell for compatibility with all popular networking hardware and software products. As a matter of fact, Samsung's 386AE is one of 3 file servers certified by Novell to run NetWare 386.

For example, engineers at Novell successfully tested the PCterminal/286 LAN Workstation in no less than 1200 different network configurations... with 50 units running at once! That's a claim no other computer manufacturer can make.

NETWORKING VS. NOTWORKING.

What's the difference? Take our 386AE Fileserver, for instance. It includes Novell's Advanced BIOS, and eight expansion slots to accommodate multiple network interface cards and disk controllers. Plus an oversize power supply capable of driving dual high capacity hard disks and tape



SAMSUNG/NOVELL

PCterminal/286

SAMSUNG/NOVELL

PCterminal/286

NG/NOVELL

16



SAMSUNG/NOVELL

PCterminal/286



SAMSUNG/NOVELL

PCterminal/286

NG/NOVELL

SERVER

back-up system. Plus 4 megabytes of main memory for disk caching.

Then there's Samsung's PCterminal/286 Diskless Workstation which includes a built-in Ethernet interface and Novell's Remote Boot EPROM.

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SAMSUNG, 3655 North First Street, San Jose, CA 95134, or call 1-800-446-0262.



SAMSUNG

drive as though it were a local drive called E:, F:, or some other letter. The program lets you specify which local drive letter represents the shared CD-ROM and which CD-ROM server you will access.

The MA.COM program also uses *NetWare's* naming structure, so on networks with multiple *NetWare* file servers, you must specify the *NetWare* server name and the name of the shared resource. The entry MA E:=SERVER2/BILL, for example, maps local drive E: to the CD-ROM drive on the PC called BILL connected to the *NetWare* file server called SERVER2.

MANAGEMENT FEATURES

In both the server and workstation programs, some of the options are available through a menu system. These menus list resources on the network and help people find and share available devices. Other useful features of *Map Assist* include the ability to call for help screens with the ?

If you can live with the possibility of some delays, *Map Assist* could well be your answer to sharing CD-ROM databases.

key and a way to unload the *Map Assist* modules by typing the program name with the "- " parameter.

The low-cost *Map Assist* program is not designed for heavy network activity. When servicing just one request, it provides response times as fast as most other CD-ROM network systems. But *Map Assist* running on the server accepts only one request at a time; if several users enter a request for data at approximately the same time, the software will queue the requests for service. If requests from three or four people are in the queue, and if the requests are complex, the wait experienced by the last person could be quite long.

Ultimately, you must look at how your CD-ROM server is likely to be used to determine if the lack of multiple simultaneous service will be a problem. If the po-

CONNECTIVITY NETWORKING CD-ROMs

tential for simultaneous multiple requests is high, then look for an alternative. But if you can live with the possibility of some delays, *Map Assist* could well be your answer to sharing CD-ROM databases.

HEWLETT-PACKARD CO. HP OfficeShare by M. Keith Thompson

HP OfficeShare, Hewlett-Packard Co.'s LAN software for MS-DOS-based PCs, is a good network alternative for people who don't want to take chances with their installations. HP offers on-site support and will install, integrate, and maintain your entire network. Overall, *HP OfficeShare* provides a complete networking solution. This includes CD-ROM capability.

Based on Microsoft's MS-Net, *HP OfficeShare* works with any CD-ROM drive that supports Version 2.1 of the Microsoft CD-ROM extensions, or MSCDEX. The LMSI-Philips drive that HP sells costs \$1,095, complete with controller card and MSCDEX; the server software costs \$1,995 for 10 users, \$2,990 for 20 users, and \$190 extra per workstation. (These prices do not include any LAN hardware, network cards, or cables.) *OfficeShare* works over 3Com EtherLink network adapter cards and with the HP twisted-pair Ethernet system. (See "Making Connections: Fast Performance over Telephone Wire," *PC Magazine*, September 13, 1988.)

While the CD-ROM drive and controller card HP offers function well, the company's CD-ROM drive solution has one major drawback for installations in multi-drive configurations: HP requires a separate controller card for each CD-ROM drive in the server. If you want four drives, you need four free expansion slots in the server computer.

NO DEDICATED SERVER

Any PC on the network can act as the CD-ROM server. It doesn't have to be dedicated to the task, but you'll get better performance if the CD-ROM controller isn't interrupted by other I/O activities.

OfficeShare's easy-to-follow installation program makes the proper directory structure and copies the files from the distribution disk to your hard disk. HP also



HP OfficeShare (\$1,995 for 10 users), is a good alternative for people who don't want to take chances with their installations. The LMSI-Philips CD-ROM drive costs an additional \$1,095.

provides a setup program for its CD-ROM drive that adds the required programs to your CONFIG.SYS and AUTOEXEC.BAT files. The only potential problem in the installation arises if you change the address of the controller card to avoid conflicts with other cards in your system. In this case, you also have to tell the device driver the new address in your CONFIG.SYS file.

The order in which you load the programs is important and will help pave the way later on. Before running the server program, you have to run MSCDEX; this lets the server software pass requests for disk information to MSCDEX, so it can get the data from the CD-ROM disk. With this approach, power users can access databases spread across multiple drives by

PC FACT FILE

HP OfficeShare

Hewlett-Packard Co., 100 Mayfield Ave., Mountain View, CA 94043; (415) 968-5600.
List Price: 10 users, \$1,995; 20 users, \$2,990; additional workstations, \$190 each; CD-ROM drive with controller, \$1,095.

Requires: LAN interface cards; DOS 3.0 to 4.0 for server, DOS 3.0 or later for workstations.

In Short: This complete networking solution offers average performance and features but is a great choice for anyone with an eye to proven support and service. HP's LMSI-Philips drive, if you use it, requires a separate controller card for each CD-ROM on the LAN—a real cost drain.

CIRCLE 425 ON READER SERVICE CARD



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PC Week, August 7, 1989

"...produces pages that look strikingly better than those produced by a 300-dpi Adobe PostScript printer"

PC Magazine, November 28, 1989

"PacificPage offers the easiest way to get PostScript output from a non-PostScript laser printer...PacificPage is also the most convenient solution because users can print files in one step, without exiting the application...The ability to scale all 35 fonts to any size and the fact that most, if not all, graphics packages have extensive PostScript support are two reasons to buy PacificPage"

PC Week, November 20, 1989



"PacificPage is the easiest to use, highest quality PostScript emulator yet."

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US list price
\$499
Dealer prices
may vary

CIRCLE 241 ON READER SERVICE CARD

giving each drive its own letter.

After installing the software, the system administrator uses a configuration program either to open CD-ROM drives to all users or to restrict access to special groups. The client stations run a different configuration program to map drive letters to the CD-ROM drive on the server. These utilities make managing a CD-ROM on the LAN as simple as managing any other device connected to the network.

Even though MSCDEX include a built-in buffering system, they look only at information about the disk and not the data itself. A third-party disk cache could reduce the CD-ROM drive's response time by about 15 percent.

Being MS-Net-based, *HP OfficeShare* gives companies a proven network with a broad base of application support. As a CD-ROM networking solution, it offers only average performance and features, but HP's reputation for service and support make this a good choice for large companies wanting a system that works.

ONLINE COMPUTER SYSTEMS INC.

Opti-Net

by M. Keith Thompson

Opti-Net from Online Computer Systems provides software and hardware options that give high-performance access to CD-ROM databases over any NetBIOS-compatible network.

The company's turnkey solution combines a four-drive CD-ROM jukebox unit, the *Opti-Net* drive-sharing software, an adapter card, and a cable. This overall system is best suited for large LANs requiring access to various databases, including multidisk libraries.

Online markets the software and hardware as separate packages but will also combine the pieces into a total system. *Opti-Net* works with any drives compatible with the Microsoft CD-ROM extensions and sells for \$795 for up to 8 users and \$1,495 for 9 to 100 users. The packaged system costs \$4,395 for a four-disk-drive unit, cabling, MSCDEX, and a 100-user license.

The *Opti-Net* server software runs in one of two modes: dedicated or nondedicated. Nondedicated operation lets you use the PC designated as a CD-ROM server to run other applications while *Opti-Net* runs in the background. The dedicated mode,

EXCLUSIVITY NETWORKING CD-ROMs



Opti-Net from Online Computer Systems (\$795 for up to 8 users) includes software and hardware options that are sold alone or as a complete system, which includes a four-drive CD-ROM jukebox unit.

however, provides faster response times and is probably the way most people will use the software, especially considering CD-ROM technology's already-slow access rate.

The server software uses up to about 80K of RAM in addition to the 30K to 100K used by typical LAN workstation software. You can also use *Opti-Net* to create CD-ROM servers on *NetWare* networks by loading Novell's NetBIOS emulator. If you do so, however, you lose about 20K of RAM to the emulator.



Opti-Net

Online Computer Systems Inc., 20251 Century Blvd., Germantown, MD 20874; (800) 922-9204, (301) 428-3700.

List Price: 1-8 users, \$795; 9-100 users, \$1,495; with 4-disk-capacity CD-ROM drive and controller, 100-user license, cabling, and MSCDEX, \$4,395

Requires: 80K RAM, NetBIOS-compatible network, CD-ROM drive and adapter card, DOS 3.1 or later

In Short: Permitting both dedicated and nondedicated modes of operation, *Opti-Net* is suitable for small and large LANs—with support for up to 32 drives—but is best suited for large LANs needing access to various CD-ROM-based databases, including multidisk libraries.

CIRCLE 426 ON READER SERVICE CARD

SIMPLE INSTALLATION

Installing *Opti-Net* could not be simpler or quicker: the Install program simply makes a directory and copies the necessary files. It also asks for permission before (instead of forgiveness after) altering your CONFIG.SYS and AUTOEXEC.BAT files. When it alters the file, the installation program makes a copy of the original.

Though setting up *Opti-Net* isn't difficult, it requires a little time and some plan-

EDITOR'S CHOICE

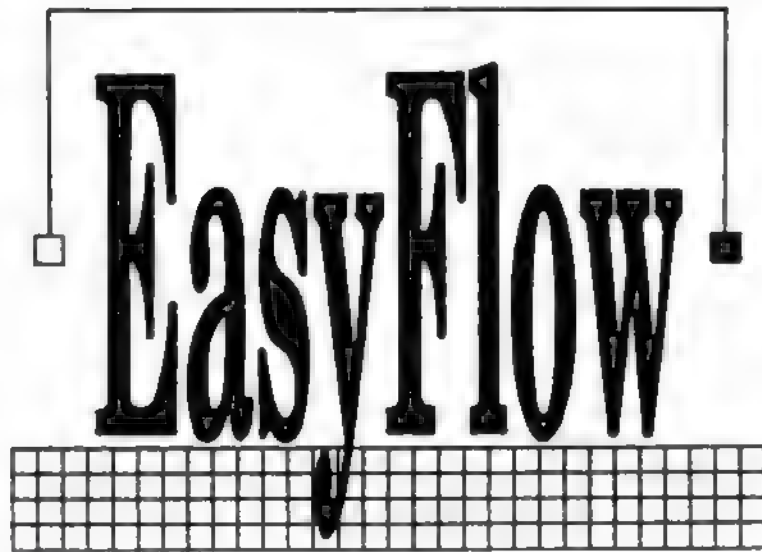
- CD Server
- LANtastic

There are really two ways to add CD-ROM capability to a network: install a LAN supporting the technology or add on a third-party system.

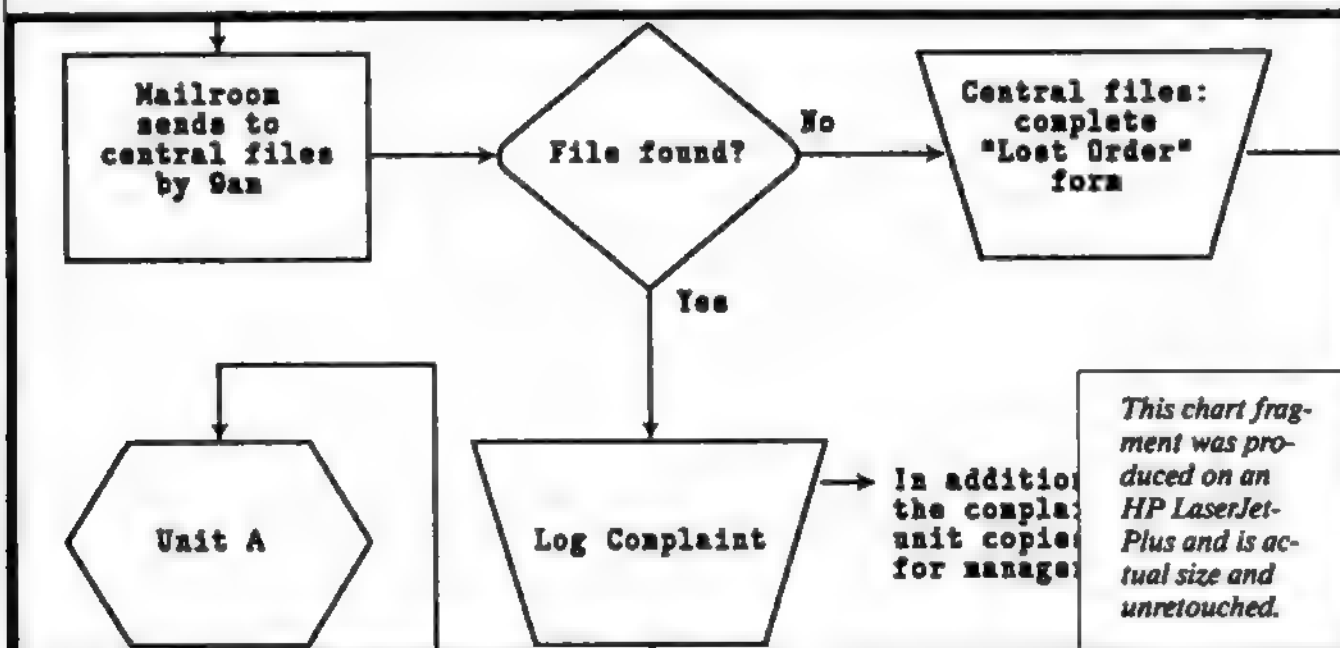
In the class of LANs with CD-ROM support built-in, the simplicity, value, and speed of Artisoft's *LANtastic* edges out CBIS's CD Server and Hewlett-Packard's *HP OfficeShare*. Client PCs do not need the Microsoft CD-ROM extensions—thus conserving RAM—and have access to more than one drive. And while the start-up costs may seem high, keep in mind that you're getting full networking capabilities as well as CD-ROM service for the price.

In the third-party add-on category, CBIS's CD Server is the only solution for *NetWare* networks needing any real computing power. Advanced Graphic Applications' *AGANET* does not work with *NetWare*, and Online Computer Systems' *Opti-Net* works only if you load NetBIOS, so that leaves *Map Assist* from Fresh Technology Group. And although *Map Assist* is simple and allows a workstation to share a CD-ROM, its response time is unacceptable for simultaneous queries. CBIS's CD Server not only wins by default, it provides good speed, plenty of expandability, and multidisk support.

ning. The system manager sets program parameters like application names and disk caching through a menu; disk caching, if selected, runs in either expanded or conventional memory. Of course, increasing cache memory also quickens the average response time.



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PO Box 1093-P
Thousand Island Park, NY 13692



Order Desk: 1-800-267-0668
Information: (613) 544-6035 ext.49
Telefax(G3): (613) 544-9632

Opti-Net includes a feature that makes it easy to find software on multiple-drive configurations. The system manager names each CD-ROM application, so users don't need to know exactly which CD-ROM database is in which drive. Each drive has a unique network name associated with its application.

If Drive 0 contains Ziff-Davis's *Computer Library*, for example, you could give it the network name LIBRARY. If Drive 1 contains *Microsoft Bookshelf*, you might choose to call it MSBOOKS. Users simply have to request a connection to the network name; the software itself will link to the right drive.

SMOOTH OPERATION

Operating the *Opti-Net* system is no more difficult than installing it. Running a program named OPTINET.EXE on the server with the "-a" parameter starts the server and prepares the applications in the drives. Adding the "-c" parameter loads *Opti-Net* as a TSR and lets the server run in nondedicated fashion. As a TSR, the key combination Alt-O gets *Opti-Net*'s attention for the server administration, status, and monitoring functions.

The program ONET.EXE runs in each networked PC and redirects requests from the application's software to the CD-ROM server. From the command line, you must tell ONET.EXE program where the CD-ROM drive resides and what database it should open.

To open an application with the alias MSBOOKS on *Opti-Net* Server 1, for example, you type "ONET-s1 -oBOOKS". To end the *Opti-Net* session and unload the TSR, you run ONET.EXE with the "-e" parameter. Of course, you can include all of these entries in a workstation's AUTOEXEC.BAT file to keep the process painless.

On the performance side, *Opti-Net* flies. It's fast, and once you get it started, it operates transparently. ■

Kimberly Maxwell is a professional newspaper reporter who writes about computer systems when she isn't covering politics in Walton County, Florida. Wendy Murch is an editorial assistant at PC Magazine. M. Keith Thompson is the inventor of the AT Turbo Switch and the founder and former CEO of Megahertz Corp. He has worked as a developer and consultant since the first Altair.



VGA WONDER



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by
Neil J. Rubenking

Lab Notes

Pascal programmers were pleasantly surprised earlier this year to find that Microsoft's new QuickPascal was a Turbo Pascal 5.0-compatible compiler with a twist: it included object-oriented extensions. Pleasant surprise quickly became an abundance of riches when Borland released Turbo Pascal 5.5, with object-oriented extensions of its own, at just about the same time.

While the battle for the hearts and minds (the dollars help, too) of the programming community is important to the companies, the differences between the two products are far less important to programmers than the arrival of object-oriented Pascal for the PC. Object-oriented Pascal represents a major step forward in programming techniques, and these will be the focus of this Lab Notes.

Object-oriented programming can trace its roots to Smalltalk, a language developed at Xerox's PARC (Palo Alto Research Center), and to Simula. In recent years C++ has contributed significantly to the development of mainstream object-oriented techniques, and along the way, Apple Computer developed Object Pascal. Both QP and TP 5.5, shown in Figures 1 and 2, respectively, descend, of course, from these roots. QuickPascal is a pure implementation of the Object Pascal specification. Turbo Pascal 5.5 has borrowed from Object Pascal, but it has also borrowed heavily from the ideas developed in C++. In a sense, then, TP 5.5 has followed a more mainstream approach to object-oriented language-compiler design.

Object-oriented Pascal is more structured than standard Pascal and more modular than Modula-2—yet at the same time it is also a significantly more flexible approach to programming. The real benefits of object-oriented programming are better demonstrated than described, however, so let's turn our attention immediately to some program examples. The sidebar "An Object-Oriented Pascal Glossary" will help with most of the terminology italicized in the discussion below.

Understanding and Programming in Object-Oriented Pascal

■ With the new language products from Microsoft and Borland, Pascal programmers can now implement the powerful techniques of object-oriented programming on the PC.

OBJECT-ORIENTED "HELLO!"

As we all know, the first exercise in Programming 101 is always a tiny program that writes the phrase "Hello!" on the screen. HELLO.PAS, shown in Figure 3, is an OO Pascal version of this program. Because of differences in their implementations of object-oriented concepts, the

listing for this short program includes separate versions for TP 5.5 and QP. After going through this installment of Lab Notes, you'll want to go back and study the sidebar "Translating Code Between Turbo Pascal 5.5 and QuickPascal," which more fully documents the implementation differences between the two products.

At the start, you'll note that HELLO.PAS defines an OBJECT type called Message. The TYPE definition resembles that of a typical Pascal Record. If you look more closely, however, you'll see that besides the expected data fields, the actual procedures and functions that act on the data are included in the definition. In object-oriented terms, these procedures and functions are referred to as *methods*. The Init method, called a CONSTRUCTOR in TP 5.5, initializes the message's data. The



Figure 1: QuickPascal's multiwindow editor allows you to look at other Units while debugging your code.

Lab Notes

Say method writes the data string to the screen. The act of wrapping up data fields with the methods that manipulate them is referred to as *encapsulation*.

The method fields of an object are simply procedure or function headers, not unlike FORWARD declarations. The actual implementation of each method comes next. Notice here that the object name qualifies

object's data field, as, for example,

```
H.Words := 'Hello!';
```

There are two reasons why you don't do this in object-oriented Pascal. First, while it is perfectly possible to access data fields directly, doing so would defeat the benefits of encapsulation and so is considered bad form. Second, if a TP 5.5 object has a CONSTRUCTOR method, you must call that method before using the object.

Now that the object is prepared, you

ject-oriented Pascal you would have to write a new program for each of these exercises. In object-oriented Pascal however, you simply *extend* the "existing" object in whatever direction you need.

INHERITANCE

Thanks to conditional compilation, the Unit HELLO2.PAS (shown in Figure 4) will compile under either TP 5.5 or QP. It starts with the same object definition as in HELLO.PAS and simply adds two more. You will frequently want to create objects related by the idea, "This is one of those, *except* . . ." That concept is a central theme in object-oriented Pascal. A PlaceMessage is a Message—*except* that it writes itself at a particular place. The line

```
PlaceMessage = OBJECT (Message)
```

says that this new type is a *descendant* of the type Message. It thus inherits all the fields and methods of its *ancestor*—you don't have to write them out again. But it can add new fields or add new methods. This message can also *override* the methods of its ancestor.

A PlaceMessage appears at particular screen coordinates, so it needs new x and y fields to hold those coordinates. Naturally, then, it also needs a new initialization method to handle the new data fields. But the Say method header looks exactly the same. *This* Say method *overrides* the Say method of the Message type.

A method that can be overridden is called a *virtual* method. In QP, all methods are virtual, but any method that overrides a previously defined method requires the override keyword. TP 5.5 methods are static (not virtual) by default—to make

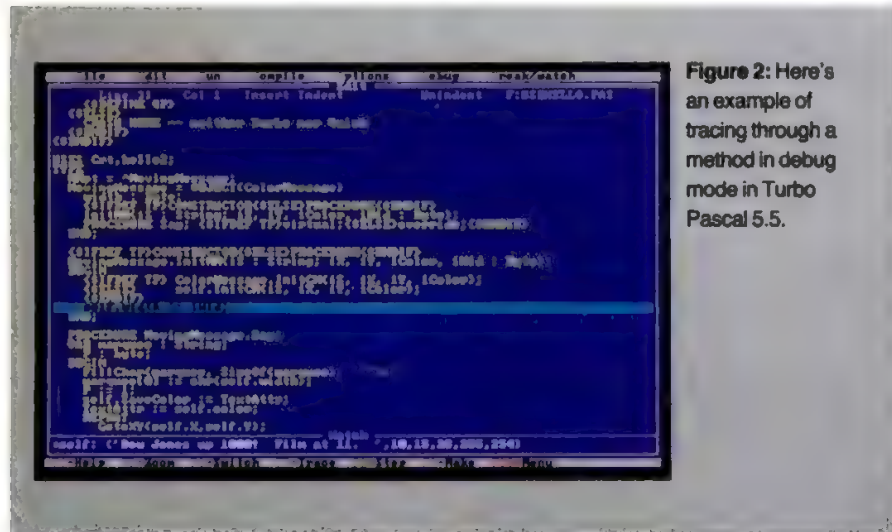


Figure 2: Here's an example of tracing through a method in debug mode in Turbo Pascal 5.5.

the method name: it is Message.Init, not just Init. This qualification allows the compiler to know to which object type this method belongs. With that knowledge it can now give you access to the data fields of that object through the *self* pseudovariable. Within a method, *self* stands for the actual *object instance* that is calling the method. You can't know the name or location of the object instance, but you can refer to its fields by using *self*, as, for example, in

```
self.X := ix;
```

In TP 5.5, the *self* parameter is assumed whenever a method uses one of the object's field names. QP, on the other hand, needs the *self* parameter explicitly written out for each reference to a field.

The next step is to declare a variable of the *object type*—an instance. Because QuickPascal objects are always dynamic, the QuickPascal version includes a new call that allocates space for the object. Whether dynamic or not, the object is nothing until it's initialized. In ordinary Pascal you would just assign a value to the

call on it to write itself. The line H.Say prints "OO Hello!" on the screen, and you can be forgiven if you think you've put in a lot of effort to produce a rather meager result! If that were *all* you wanted to do, HELLO.PAS *would* be absurd. But the next two programming exercises involve writing a string to a particular spot on the screen and writing it in color. In nonob-

HELLO.PAS (2 Versions)	COMPLETE LISTING
<pre>PROGRAM Hello; (* Turbo Pascal 5.5 version *) TYPE message = OBJECT words : String; CONSTRUCTOR Init(is : String); PROCEDURE Say; END; CONSTRUCTOR Message.Init(is : String); BEGIN words := is; END; PROCEDURE Message.Say; BEGIN WriteLn(words); END; VAR H : message; BEGIN H.Init('OO Hello!'); H.Say; END.</pre>	<pre>PROGRAM Hello; (* QuickPascal version *) TYPE message = OBJECT words : String; PROCEDURE Init(is : String); PROCEDURE Say; END; PROCEDURE Message.Init(is : String); BEGIN self.words := is; END; PROCEDURE Message.Say; BEGIN WriteLn(self.words); END; VAR H : message; BEGIN New(H); H.Init('OO Hello!'); H.Say; END.</pre>

Figure 3: Although QuickPascal and Turbo Pascal 5.5 have many similarities, specific differences in the ways they implement their object-oriented extensions often require using different source listings.

Lab Notes

them virtual you have to add the `virtual` keyword. Note that you can never change the header of a virtual method in a descendant type, though you can change its action.

The `PlaceMessage.Init` call sets up the data fields for your `PlaceMessage` variable. First it calls the inherited `Message.Init` to set up the inherited data fields, then it initializes the new fields. `PlaceMessage.Say` also uses an inherited routine. It moves the cursor to the proper *x*- and *y*-coordinates, then calls `Message.Say`.

`PlaceMessage` is a descendant of `Message` and an ancestor of `ColorMessage`. A `ColorMessage` is a `PlaceMessage`—*except* it appears in a particular color. Before writing a message, it stores the current text color and changes to its own color. Afterward, it restores the previous text color. The `ColorMessage` object type adds a data field to hold the display color and another field to store the previous color. It has a new initialization method and a `Say` method that overrides that of `PlaceMessage`. `PlaceMessage` and `ColorMessage` thus both *extend* the `Message` object type.

The next several type declarations set up pointers to each of the objects in the *hierarchy*, and they establish a linked list of pointers to the original `Message` type. This linked list type becomes the data field of the `List` object, whose *methods* can initialize a list, add a message, and display all the messages.

In object-oriented Pascal, descendant object types have a very special kind of compatibility with their ancestor types. Note this point carefully: *a pointer to an ancestor type can actually point to an instance of any descendant type*. A procedure whose `VAR` parameter is an ancestor type can accept an actual parameter of any descendant type. The object will retain its own identity—when you call one of its virtual methods it will be the right method for that type of object. In the example program in Figure 2, the actual parameter corresponding to the `MP` formal parameter in `List.Add` can be a pointer to any of the three types.

POLYMORPHISM

The `List.Show` method simply takes each list element in turn and calls its `Say` method. `P.data` is an object whose type isn't known until runtime—a *polymorphic* ob-

HELLO2.PAS

1 of 2



```

UNIT Hello2;

{$IFDEF ver55;
  {$DEFINE TP;
{$ELSE;
  {$IFDEF ver10;
    {$DEFINE QP;
  {$ELSE;
    CRASH HERE -- neither Turbo nor Quick
  {$ENDIF;
{$ENDIF;

(*****
(**)  INTERFACE  (**)
(*****

USES Crt;
TYPE
  Message = OBJECT
    words : String;
    {$IFDEF TP;CONSTRUCTOR {$ELSE} PROCEDURE {$ENDIF;
    Init(iS : String);
    PROCEDURE Say; {$IFDEF TP;virtual;{$ENDIF;
  END;

  PlaceMessage = OBJECT(Message)
    X,Y : Byte;
    {$IFDEF TP;CONSTRUCTOR {$ELSE} PROCEDURE {$ENDIF;
    InitPM(iS : String; iX,iY : Byte);
    PROCEDURE Say; {$IFDEF TP;virtual;{$ELSE;override;{$ENDIF;
  END;

  ColorMessage = OBJECT(PlaceMessage)
    color, SaveColor : Byte;
    {$IFDEF TP;CONSTRUCTOR {$ELSE} PROCEDURE {$ENDIF;
    InitCM(iS : String; iX, iY, iColor : Byte);
    PROCEDURE Say; {$IFDEF TP;virtual;{$ELSE;override;{$ENDIF;
  END;

  MsPt = ^Message;
  PMPt = ^PlaceMessage;
  CMPt = ^ColorMessage;
  MsgList = ^MsgNode;
  MsgNode = RECORD
    data : MsPt;
    next : MsgList;
  END;

  List = OBJECT
    Nodes : MsgList;
    {$IFDEF TP;CONSTRUCTOR {$ELSE} PROCEDURE {$ENDIF;
    Init;
    PROCEDURE Add(MP : MsPt);
    PROCEDURE Show;
  END;

(*****
(**) IMPLEMENTATION (**)
(*****

{$IFDEF TP;CONSTRUCTOR {$ELSE} PROCEDURE {$ENDIF;
Message.Init(iS : String);
BEGIN self.words := iS; END;

PROCEDURE Message.Say;
BEGIN Write(self.words); END;

{$IFDEF TP;CONSTRUCTOR {$ELSE} PROCEDURE {$ENDIF;
PlaceMessage.InitPM(iS : String; iX, iY : Byte);
BEGIN
  {$IFDEF TP} Message.Init(iS);
  {$ELSE} self.Init(iS);
  {$ENDIF;
  self.X := iX;
  self.Y := iY;
END;

PROCEDURE PlaceMessage.Say;
BEGIN
  GotoXY(self.X,self.Y);
  {$IFDEF TP} Message.Say;
  {$ELSE} Inherited self.Say;
  {$ENDIF;

```

Figure 4: This sample program extends the object defined in Figure 3 to include writing to a specific screen location and writing in color. The use of conditional compilation directives allows this code to compile under *either* Turbo Pascal 5.5 or QuickPascal.

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Lab Notes

HELLO2.PAS

2 of 2

```

END;

{$IFDEF TP}CONSTRUCTOR {$ELSE} PROCEDURE {$ENDIF}
ColorMessage.InitCM(is : String; ix, iy, icolor : Byte);
BEGIN

    {$IFDEF TP} PlaceMessage.InitPM(is,ix,iy);
    {$ELSE} self.InitPM(is,ix,iy);
    {$ENDIF}
    self.color := icolor;
END;

PROCEDURE ColorMessage.Say;
BEGIN
    self.SaveColor := TextAttr;
    TextAttr := self.color;
    {$IFDEF TP} PlaceMessage.Say;
    {$ELSE} Inherited self.Say;
    {$ENDIF}
    TextAttr := self.SaveColor;
END;

{$IFDEF TP}CONSTRUCTOR {$ELSE} PROCEDURE {$ENDIF}
List.Init;
BEGIN self.Nodes := NIL; END;

PROCEDURE List.Add(MP : MsgPt);
VAR P : MsgList;
BEGIN
    New(P);
    P^.data := MP;
    P^.next := self.nodes;
    self.nodes := P;
END;

PROCEDURE List.Show;
VAR P : MsgList;
BEGIN
    P := self.nodes;
    WHILE P <> NIL DO
        BEGIN
            P^.data^.say;
            P := P^.next;
        END;
    END;
END.

```

USEHELLO.PAS

1 of 2

```

PROGRAM Use_Hello;
(* Conditional compilation directives allow this
   code to compile under _either_ TP5.5 or QP *)

{$IFDEF ver55}
{$DEFINE TP}
{$ELSE}
{$IFDEF ver16}
{$DEFINE QP}
{$ELSE}
    CRASH HERE -- neither Turbo nor Quick
{$ENDIF}
{$ENDIF}

USES Crt,hello2;
TYPE
    MMpt = ^MovingMessage;
    MovingMessage = OBJECT(ColorMessage)
        width : Byte;
    {$IFDEF TP}CONSTRUCTOR{$ELSE}PROCEDURE{$ENDIF}
    InitMM(is : String; ix, iy, icolor, iwid : Byte);
    PROCEDURE Say; {$IFDEF TP}virtual;{$ELSE}override;{$ENDIF}
    END;

{$IFDEF TP}CONSTRUCTOR{$ELSE}PROCEDURE{$ENDIF}
MovingMessage.InitMM(is : String; ix, iy, icolor, iwid : Byte);
BEGIN
    {$IFDEF TP} ColorMessage.InitCM(is, ix, iy, icolor);

```

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Figure 5: USEHELLO.PAS exercises the objects in Figure 4 and adds to the object hierarchy.

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Lab Notes



Figure 6: The "HelpSet" object stores and recalls help messages quickly, but it uses a lot of RAM.

ject. When the compiler encounters an ordinary "static" procedure or function call, it can immediately write out a call to the specific address. This compile-time resolution is called *early binding*. But when it comes to a polymorphic object's virtual method, the compiler can't work out the address in advance. At runtime, then, the program chooses the proper method, based on the type of the specific object instance. This runtime resolution is called *late binding*.

The USEHELLO.PAS, program shown in Figure 5, puts these objects to work and illustrates an amazing property

**Encapsulation,
inheritance,
extendability and
polymorphism are four
very important
concepts behind
object-oriented
programming.**

of polymorphic objects. The program adds a new MovingMessage type that is an extension of ColorMessage. This object type did not exist when HELLO2.TPU was compiled, yet the List.Add and List.Show routines can deal with it. Extended type compatibility holds for any descendant type, even if it was defined long *after* a given Unit was compiled!

The main body of the program illustrates a convenient object-oriented extension that is particular to TP 5.5. The New procedure has two new features. First, if you are allocating a dynamic object that has virtual methods, you can put the CONSTRUCTOR call right into the call to New—as, for example in

```
New(MyObject, Init(1,2,3));
```

Second, you can use New with a pointer type identifier as if it were a function returning a pointer of that type. It therefore becomes easy to create pointers and to pass them as parameters without having to cre-

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Lab Notes

HELP.PAS

2 of 2

```

PROCEDURE DoneWithHelp;
END;

(*****
(**) IMPLEMENTATION (**)
*****)

PROCEDURE HelpSet.InitHelp(isize : Word);
BEGIN
    self.size := isize;
    self.number := 0;
    GetMem(self.messages, SizeOf(pointer)*isize);
END;

FUNCTION HelpSet.AddMessage(M : String): Boolean;
BEGIN
    IF self.number = self.size THEN AddMessage := FALSE
    ELSE
        BEGIN
            Inc(self.number);
            GetMem(self.messages^self.number, succ(length(M)));
            self.messages^self.number := M;
            AddMessage := TRUE;
        END;
    END;
END;

FUNCTION HelpSet.GetMessage(N : Word): String;
BEGIN
    IF N > self.number THEN GetMessage := ''
    ELSE
        GetMessage := self.messages^N;
    END;
END;

PROCEDURE HelpSet.DoneWithHelp;
VAR N : Word;
BEGIN
    {Free up space taken by individual messages}
    FOR N := self.number downto 1 DO
        FreeMem(self.messages^N, succ(length(self.messages^N)));
    {Free up space used for array of pointers to messages}
    FreeMem(self.messages, SizeOf(pointer)*self.size);
END;
END.
```

USEHELP.PAS

1 of 2

```

PROGRAM UseHelp;
(* QuickPascal program *)

USES Crt,
    help2;
VAR
    H1 : HelpSet;
    N : word;
    Avail : LongInt;

FUNCTION RandMessage(W:Word):string;
VAR
    Temp : String;
    M : Byte;
BEGIN
    Temp := '';
    FOR N := 1 to Random(6)+2 DO
        CASE Random(5) OF
            0: Temp := Temp + ' HELP';
            1: Temp := Temp + ' help';
            2: Temp := Temp + ' assistance';
            3: Temp := Temp + ' m'aidez';
            4: Temp := Temp + ' socorro';
        END;
    END;
    RandMessage := Temp + '!';
END;

BEGIN
    Randomize;
    ClrScr;
```

Figure 7: This demonstrates the use of the "HelpSet" object. It fills the object with randomly created messages, accesses some of the messages nonsequentially, and then disposes of the object.

Lab Notes

ate and initialize temporary variables. You can accomplish the same thing in QuickPascal, but it's a more cumbersome, four-step process. You must declare a temporary pointer variable P; allocate it with New(P); initialize the object it points to with New(P[^]); and initialize the object's data with

```
P^.Init(<arguments>)
```

The final lines of the USEHELLO.PAS

program in Figure 5 illustrate the difference between the two implementations.

The set of HELLO programs provided here has demonstrated four important concepts of object-oriented programming. Objects have code and data bundled together—encapsulation. Objects can inherit data fields and methods from their ancestors. An existing object can be extended to handle new circumstances. And properly written procedures will handle polymorphic objects of any descendant type.

OBJECTS AS STANDARD COMPONENTS

Once you've written an object and compiled it in a Unit, you can thereafter treat it

as a self-contained module. Plug it into programs as needed—it's completely reusable. All anyone needs to use your compiled Unit is a listing of its method calls and a description of what they do. Later, if the object needs to be changed, you can replace it with any other object that has the same method calls and accomplishes the same task.

The three QP example programs presented in Figures 6 through 8 illustrate this process in action. Let us suppose that HELP.PAS (Figure 6) is your contribution to a multiprogrammer project. It defines a HelpSet object that holds up to 500 strings of help messages, and it has methods that

AN OBJECT-ORIENTED PASCAL GLOSSARY

by Neil J. Rubenking

Abstract object type—an object type created to serve only as an ancestor. An Abstract Object type can't have an instance of itself.

Ancestor—an object type above a given type in the object hierarchy. The parent type of a descendant type.

Child type—see Descendant.

Class—an object type.

Constructor method—in Turbo Pascal 5.5, a method (always static) that initializes the VMT and (optionally) the object's data fields. It is required by any object that has virtual methods. The syntax of the "New" procedure is extended to include an optional call to the object's CONSTRUCTOR.

Container object—an object whose purpose is to store other objects; for example, a stack, queue, or hash table.

Descendant—an object type that inherits from a given type. The child of an ancestor.

Destructor method—in Turbo Pascal 5.5, a method for cleaning up and disposing of dynamic objects. The Dispose procedure is extended to include an optional call to the DESTRUCTOR, which also guarantees that the correct number of bytes will be deallocated.

Dynamic object—an object allocated on the heap. All QuickPascal objects are dynamic. TP 5.5 objects are dynamic only if explicitly declared so.

Early binding—the process in which the compiler binds a procedure call to the procedure itself by building a direct CALL to the procedure's address.

Encapsulation—the process of defin-

ing data and code together in a single object.

Extensibility—the ability to create descendant objects that add methods and data fields to those they have inherited, without requiring the source code of the ancestor object. The added methods may be new, or they may override existing methods.

Hierarchy—a tree structure that shows the ancestor/descendant relationships for a set of related objects.

Inheritance—the process by which a descendant object retains all data fields and methods declared by any of its ancestors.

Instantiate—to declare a variable of a given object type.

Late binding—the process by which a procedure call is bound to the procedure itself indirectly, with the actual address for the CALL determined at runtime.

Method—a procedure or function defined within an object TYPE declaration. A method has direct access to the data fields of the object instance that calls it.

Object type—a data type that can include both data fields and methods that act on those fields.

Object instance—a variable declared to be of an OBJECT type.

Override—to redefine an inherited method. In QuickPascal this requires the override keyword.

Parent type—see Ancestor.

Polymorphism—from "many shapes" in Greek, this term refers to the extended compatibility in object-oriented Pascal. A pointer to a given object

type may point to any descendant of that type, and virtual method calls will be evaluated at runtime to call the correct descendant's method.

Predator*—a method that attacks other objects by locating and calling their DESTRUCTORS.

Private method—a method accessible only within other methods of the same object type. This is a C++ concept, and is not implemented in object-oriented Pascal.

Public method—a method accessible to any instance of the object type. All OO Pascal methods are public.

Static object—an object allocated in the Data segment. Turbo Pascal 5.5 objects are static unless explicitly declared as dynamic.

Static method—a nonvirtual or early bound method; not available in QP.

Subclass—a descendant of a particular class.

Superclass—an ancestor of a particular class.

Virtual method—a method called with late binding. In TP 5.5, virtual methods require the virtual keyword.

Virtual method table (VMT)—a table of offsets used internally for calling virtual methods. All QuickPascal object types have a VMT; Turbo Pascal 5.5 objects with no virtual methods and no CONSTRUCTOR do not. Each instance of an object type that has a VMT includes a pointer to the VMT. ■

**For the uninitiated, this function was humorously proposed by Borland's Anders Heilsberg.*

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Lab Notes

USEHELP.PAS

2 of 2

```
WriteLn('Demonstrating "HelpSet" object');
Avail := MaxAvail;
New(H1);
H1.InitHelp(500);
N := 0;
REPEAT
  Inc(N);
UNTIL NOT H1.AddMessage(RandMessage(N));
Avail := Avail - MaxAvail;
FOR N := 1 to 10 DO
  BEGIN
    WriteLn('1', 2*N:3, ' ', H1.GetMessage(2*N));
    WriteLn('2', 501-2*N:3, ' ', H1.GetMessage(501-2*N));
  END;
H1.DoneWithHelp;
Dispose(H1);
WriteLn('The object used ', Avail, ' bytes.');
```

HELP2.PAS

1 of 2

```
(* QuickPascal program *)

UNIT Help2;
(*****
**) INTERFACE (**)
(*****
USES Help, Dos;
TYPE
  NameStr = String(8);
  HelpSet = OBJECT
    size, number : Word;
    data : File;
    indx : File of Word;
  PROCEDURE InitHelp(iSize : Word);
  FUNCTION AddMessage(M : String): Boolean;
  FUNCTION GetMessage(B : Word): String;
  PROCEDURE DoneWithHelp;
  END;

(*****
**) IMPLEMENTATION (**)
(*****

FUNCTION RandomName : NameStr;
VAR N : Byte;
    temp : NameStr;
BEGIN
  FOR N := 1 to 8 DO
    temp[N] := Char(random(128)+128);
  temp[0] := #0;
  RandomName := temp;
END;

PROCEDURE HelpSet.InitHelp(iSize:Word);
(* In a real-world application, you would deal with
real-world problems -- already-existing filename,
invalid filename, full disk, etc. In order to
keep this example short we omit that kind of checking.
*)
VAR name : NameStr;
BEGIN
  Randomize;
  REPEAT name := RandomName;
  UNTIL FSearch(name+'.DAT', '') = '';
  Assign(self.data, name+'.DAT');
  Rewrite(self.data, 1);
  REPEAT name := RandomName;
  UNTIL FSearch(name+'.IDX', '') = '';
  Assign(self.indx, name+'.IDX');
  Rewrite(self.indx);
  self.size := iSize;
  self.number := 0;
END;

FUNCTION HelpSet.AddMessage(M : String): Boolean;
VAR loc : Word;
```

Figure 8: This alternate implementation of the "HelpSet" object stores the messages on-disk instead of in RAM—but the method headers are identical.

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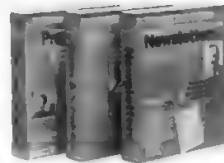
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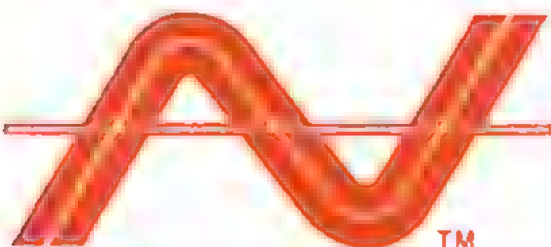
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Lab Notes

HELP2.PAS

2 of 2

```
BEGIN
  IF self.number = self.size THEN AddMessage := FALSE
  ELSE
    BEGIN
      Inc(self.number);
      loc := FilePos(self.data);
      Write(self.indx, loc);
      BlockWrite(self.data, M, succ(length(M)));
      AddMessage := TRUE;
    END;
  END;

FUNCTION HelpSet.GetMessage(B : Word): String;
VAR temp : String;
    Loc : Word;
BEGIN
  IF B > self.number THEN GetMessage := ''
  ELSE
    BEGIN
      {Get the location from the index file}
      Seek(self.indx, pred(B));
      Read(self.indx, Loc);
      {Set the index file to receive more messages}
      Seek(self.indx, FileSize(self.indx));
      {Find and read the message itself}
      Seek(self.data, loc);
      BlockRead(self.data, temp, 1);
      BlockRead(self.data, temp[1], ord(temp[0]));
      {Set the data file to receive more messages}
      Seek(self.data, FileSize(self.data));
      GetMessage := temp;
    END;
  END;

PROCEDURE HelpSet.DoneWithHelp;
BEGIN
  Close(self.data);
  Erase(self.data);
  Close(self.indx);
  Erase(self.indx);
END;

END.
```

will initialize the object, add a message to the set, return a particular numbered message, and dispose of the object's data fields. The program USEHELP.PAS, shown in Figure 7, sets up a HelpSet and fills it with randomly created messages. It accesses some of the messages nonsequentially and then disposes of the object.

In our project scenario let us also suppose that the actual detailed workings of HELP.PAS have not yet been fine-tuned. You can pass along the compiled, albeit nonoptimal, Unit to the other team members, together with a listing of the method headers. They can then build their portions of the program, accessing your HelpSet object only through its known methods.

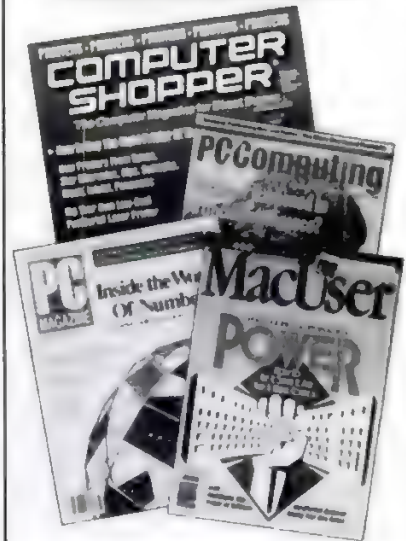
Now a problem arises: the other team members find that the HelpSet objects take too much RAM. You expected that, since you knew you hadn't optimized your code, so while the others were working on their end of the project, you were busy fixing the problem in advance by fine-tuning your code. Without ever affecting the other programmers at all, you've been able to

rewrite the "private," internal workings of the object while leaving the "public" method headers unchanged.

Your final effort, then—the Unit HELP2.PAS shown in Figure 8—contains a very different HelpSet object, though the method calls remain the same. This object stores the messages in an indexed temporary file on-disk. The initialization routine creates uniquely named data and index files, and the cleanup routine erases them. Try it—replace "Help" with "Help2" in the USES clause and recompile USEHELP.PAS. It's a fraction slower at accessing the messages, since they're on-disk, but it takes much less RAM.

By using objects, therefore, one or more programmers can create self-contained software modules that work together in a larger whole. These modules can be created and debugged separately, and if problems turn up in one of them, the buggy module can easily be replaced. Such modular programming mitigates the complexity of working with very large programs and complex programming environments.

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Lab Notes

It becomes much easier for programmers to concentrate on the "big picture" when the details are encapsulated in objects.

OBJECTS AS ABSTRACT DATA TYPES

Computer Science concepts are often taught in terms of abstract data types

(ADTs). An ADT consists of a mathematical model together with a set of operations defined on that model. Common ADTs include stacks, queues, linked lists, and hash tables. When you need to write a queue in ordinary Pascal, you may well refer to the ADT description and then code a particular implementation for the data structure you want to queue up. If you want to use the queue concept for another data type, however, you will no doubt need to write the

implementation all over again.

The process changes completely under object-oriented programming. An ADT becomes an *abstract object type*: the "mathematical model" part corresponds to the data fields and "operations defined on that model" are the methods. Thus you can write a Unit that will define a particular ADT once and then you'll never have to write it again. A Unit with your implementation of these *container objects* will be-

TRANSLATING CODE BETWEEN TURBO PASCAL 5.5 AND QUICKPASCAL

by Neil J. Rubenking

Although Turbo Pascal 5.5 and QuickPascal are very similar, their object-oriented extensions differ in specifics. Thus, you can't compile identical object-oriented code under both. Here are some tips on translating from one implementation to the other.

QUICKPASCAL TO TURBO PASCAL 5.5

- QuickPascal objects are allocated with `new`, like pointers. Remove the `new` statements that initialize objects. Be careful when dealing with pointer-to-object variables—they always have two `new` statements, so be sure to delete only the correct one.

- For each object, change the initialization routine from `PROCEDURE` to `CONSTRUCTOR`. If the object has a "cleanup routine," change it from `PROCEDURE` to `DESTRUCTOR`. Note that if a Turbo Pascal 5.5 program uses `dispose` on a polymorphic object, the object must have a `DESTRUCTOR`. If the object doesn't have a "cleanup" procedure, you should add an empty `DESTRUCTOR` (just `BEGIN..END`) called "done". Include the call to the `DESTRUCTOR` in each `dispose`, for example:

```
Dispose(MyObjectPtr, done);
```

- All methods are virtual in QuickPascal, so add the `virtual` keyword to every method that isn't a `CONSTRUCTOR`. Start by replacing all occurrences of `override` with `virtual`—that will save some typing.

- If you never plan on moving the particular program back to QuickPascal, find and delete all occurrences of the `self` characters. The `self` pseudo-variable isn't necessary in Turbo Pascal

5.5, except occasionally to resolve identifier conflicts.

- You may sometimes need to call an ancestor's method that has been overridden. QP uses the `Inherited` keyword. Thus

```
Inherited self.methodname
```

calls a method from the immediate ancestor, and

```
Inherited ancestorname  
(self).methodname
```

calls a method from the ancestor of `ancestorname`. In TP 5.5, just qualify the method name with the particular ancestor's name, for example:

```
ancestorname.methodname
```

TURBO PASCAL 5.5 TO QUICKPASCAL

- QuickPascal objects are all dynamic, and every instance variable needs a new statement before its initialization. Search the program for object-initialization calls and insert the required new statements.

- QuickPascal doesn't require `CONSTRUCTORS` or `DESTRUCTORS`, so use a global find and replace to change these words to `PROCEDURE`. Some Turbo Pascal 5.5 objects will have empty `DESTRUCTORS`, which consist simply of a `BEGIN..END` pair. Simply delete these.

- All methods in QuickPascal are virtual, but to override a virtual method requires the `override` keyword. First find all occurrences of `virtual` and replace them with `override`. The first occurrence of an overridden method doesn't need `override`, but it's easi-

est to let the compiler find those. You just have to try to compile, and remove any `override` that the compiler flags as an error.

- QuickPascal requires the `self` qualifier in front of data fields in methods. Go through all methods and add it at each reference to a data field.

- In Turbo Pascal 5.5, to call an ancestor's method that has been overridden, you have to qualify the method name with the name of the ancestor, for example,

```
ancestorname.methodname
```

In QP, you use the `Inherited` keyword with the descendant that directly inherits the method. For an immediate ancestor, use

```
Inherited self.methodname
```

For an ancestor's ancestor, typecast `self` to the ancestor type that directly inherits the method, that is,

```
Inherited ancestorname  
(self).methodname
```

- Nonvirtual methods are called "static" in Turbo Pascal 5.5. A static method can override an inherited method that has the same name but a different header. For example, `CONSTRUCTORS` are commonly all called `Init` in Turbo Pascal 5.5. To translate for QuickPascal, rename one of the methods and search the program for occurrences, changing them by hand to the new name.

- Turbo Pascal 5.5 has extended the syntax of `new` in a number of ways. First, if the object has a `CONSTRUCTOR` you can include a call to it in the new

Lab Notes

come an invaluable tool.

To illustrate the point, QUEUES.PAS (see Figure 9) is a TP 5.5 Unit that implements an abstract "queue." A queue is a First In First Out (FIFO) list with four defined operations: add an item to the rear of the queue, remove and return the item at

statement, as in this example:

```
INSERT SB2-H(22)-11line
```

The QuickPascal equivalent of this would be

```
New(MyObjectPtr); {allocate
pointer}
New(MyObjectPtr^); {allocate
object}
MyObjectPtr^.Init(1,2,3);
{initialize object}
```

These three lines allocate the pointer, allocate the object, and initialize the object, respectively.

Second, new can be treated as a function that returns a pointer to the particular type. Take the following for example:

```
AddToList( New (MyObjectPtrType,
Init(1,2,3)));
```

In QuickPascal, you'll need a temporary variable of MyObjectPtrType.

■ Turbo Pascal 5.5 also extends the syntax of Dispose. You can include a DESTRUCTOR in the call to Dispose. If the DESTRUCTOR procedure does anything, simply call it before disposing the object. The equivalent of the Turbo Pascal 5.5

```
Dispose(MyObjectPtr, done);
```

would be

```
MyObjectPtr^.done; {if "done"
method is non-empty}
Dispose(MyObjectPtr^);
{deallocate the object}
Dispose(MyObjectPtr);
{deallocate the pointer}
```

QUEUES.PAS

1 of 2



```
UNIT queues;
(* Turbo Pascal 5.5 program *)

(*****
**)      INTERFACE      (**)
(*****

TYPE
  GenericItem = OBJECT           {This object is nothing}
    DESTRUCTOR done; virtual;   {by itself, but you can}
  END;                          {make ANY other object }
                                {a descendant of it.  }

  ItemPtr = ^GenericItem;
  ItemList = ^ItemNode;
  ItemNode = RECORD
    item : ItemPtr;
    next : ItemList;
  END;

  queue = OBJECT (GenericItem)
    front, rear : ItemList;
    length, maxlength : Word;
    CONSTRUCTOR Init;
    PROCEDURE MakeNull;
    PROCEDURE enqueue(I : ItemPtr);
    FUNCTION dequeue : ItemPtr;
    FUNCTION empty : boolean;
    FUNCTION GetLength : Word;
    FUNCTION GetMax : Word;
    DESTRUCTOR done; virtual;
  END;

(*****
**)      IMPLEMENTATION      (**)
(*****

DESTRUCTOR GenericItem.done; BEGIN END;

CONSTRUCTOR queue.Init;
{ To initialize a queue, create a "front" pointer
for it and set the "rear" pointer to the same
as the front. Note that the actual queue of
items starts at "front^.next" -- "front" is
just a header node }
BEGIN
  New(front);
  front^.next := NIL;
  front^.item := NIL;
  rear := front;
  length := 0;
  maxlength := 0;
END;

PROCEDURE queue.MakeNull;
{ To empty a queue, dispose of nodes until
the front of the line equals the rear }
VAR P : ItemList;
BEGIN
  WHILE front <> rear DO
  BEGIN
    P := front;
    front := front^.next;
    IF P^.item <> NIL THEN
      dispose(P^.item, done);
    dispose(P);
  END;
END;

PROCEDURE queue.enqueue(I : ItemPtr);
{ To enqueue an item, add it to the rear of the queue }
BEGIN
  Inc(length);
  IF length > maxlength THEN maxlength := length;
  New(rear^.next);
  rear := rear^.next;
  rear^.item := I;
  rear^.next := NIL;
END;

FUNCTION queue.dequeue : ItemPtr;
{ To dequeue an item, return the contents of the
frontmost node (the one after the "front" header),
advance the front pointer, and dispose of the
```

Figure 9: QUEUES.PAS implements a generic queue object—you can queue up anything with this Unit. You can even have a queue of queues.

She's 5 years old.
She's already had
7 names,
16 identities and
21 homes.



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Lab Notes

QUEUES.PAS

2 of 2

```

previous front ;
VAR P : ItemList;
BEGIN
  IF empty THEN dequeue := NIL
  ELSE
    BEGIN
      dequeue := front^.next^.item;
      P := front;
      front := front^.next;
      front^.item := NIL;
      dispose(P);
      Dec(length);
    END;
  END;

  FUNCTION queue.empty : boolean;
  BEGIN empty := front = rear; END;

  FUNCTION queue.GetLength : Word;
  BEGIN GetLength := length; END;

  FUNCTION queue.Getmax : Word;
  BEGIN Getmax := maxlength; END;

  DESTRUCTOR queue.done;
  { This procedure calls MakeNull to dispose
    all of the nodes except "front", then
    gets rid of "front" as well }
  BEGIN
    MakeNull;
    dispose(front);
  END;
END.

```

BANK.PAS

1 of 2

```

PROGRAM bankdemo;
(* Turbo Pascal 5.5 program *)
USES queues,crt;
TYPE
  PatronPt = ^PatronItem;
  PatronItem = OBJECT (GenericItem)
    TaskTime : Word;
    CONSTRUCTOR Init(min,max : Byte);
    FUNCTION GetTime : Word;
    DESTRUCTOR Done; virtual;
  END;

  ActionType = (NewPatron, Serving, Idle);

  Bank = Object
    Q : queue;
    time, timeleft, idletime : Word;
    AvgMins, Shortest, Longest : Byte;
    CONSTRUCTOR Init(AMBP, ST, LT : Byte);
    DESTRUCTOR Done;
    FUNCTION GetTime : Word;
    PROCEDURE Tick;
  END;

  CONSTRUCTOR PatronItem.Init(min,max : Byte);
  BEGIN
    TaskTime := 10*(min+random(succ(max-min)));
  END;

  DESTRUCTOR PatronItem.Done;
  BEGIN END;

  FUNCTION PatronItem.GetTime : Word;
  BEGIN GetTime := TaskTime; END;

  CONSTRUCTOR Bank.Init(AMBP, ST, LT : Byte);

```



Figure 10: This bank-teller simulation exercises the QUEUES Unit. It also demonstrates an important aspect of object-oriented programming: polymorphism.

Lab Notes

BANK.PAS

2 of 2

```

BEGIN
  Randomize;
  Q.Init;
  time := 0; timeLeft := 0; idletime := 0;
  AvgMins := AMBP;
  Shortest := ST;
  Longest := LT;
  Write('Now beginning bank simulation. ');
  WriteLn('New patrons arrive on the average of');
  Write('every ',AvgMins,' minutes. Their business ');
  WriteLn('takes from ',shortest,' to ',longest,' minutes.');
```

END;

```

DESTRUCTOR Bank.Done;
BEGIN
  WriteLn;
  Write('The simulation ran for ',time DIV 10,'.',time MOD 10);
  WriteLn(' simulated minutes. Of that time, the clerk');
  Write('was idle for ',idletime DIV 10,'.',idletime MOD 10);
  WriteLn(' simulated minutes. Maximum length of ');
  WriteLn('queue was ',Q.GetMax);
  Q.done;
END;
```

```

FUNCTION Bank.GetTime : Word;
BEGIN GetTime := Time; END;
```

```

PROCEDURE Bank.Tick;
VAR
  A : PatronPt;
  G : ItemPtr;

  PROCEDURE Event(Act : ActionType; T, L : Word);
  BEGIN
    Write(T DIV 10:4,'.',T MOD 10,' minutes ');
    CASE Act OF
      NewPatron : Write('New patron joined queue. ');
      Serving   : Write('Clerk is serving a patron. ');
      Idle      : Write('Clerk is idle. ');
    END;
    WriteLn(' ',L:4,' in queue.');
```

END;

```

BEGIN
  Write(time DIV 10:4,'.',time MOD 10,'M');
  IF random(10*AvgMins) = 0 THEN
    BEGIN
      Q.enqueue(new(PatronPt,Init(Shortest, Longest)));
      Event(NewPatron, time, Q.length);
    END;
  IF timeleft <= 1 THEN
    BEGIN
      A := PatronPt(Q.dequeue);
      IF A <> NIL THEN
        BEGIN
          timeleft := A^.GetTime;
          Dispose(A,done);
          Event(Serving, time, Q.length);
        END
      ELSE
        BEGIN
          Inc(IdleTime);
          IF timeleft = 1 THEN Event(idle, time, Q.length);
        END;
      Inc(Time);
      IF timeleft > 0 THEN dec(timeleft);
      delay(100);
    END;
```

```

VAR FirstNational : Bank;

BEGIN
  Randomize;
  FirstNational.Init(4,3,5);
  REPEAT
    FirstNational.tick;
  UNTIL KeyPressed OR (FirstNational.GetTime >= 600);
  FirstNational.done;
END.
```

the front of the queue, report whether the queue is empty, and make the queue empty. These operations are implemented in the program example as "enqueue," "dequeue," "empty," and "makenull," respectively. QUEUES.PAS also has data fields that contain the current queue length and the maximum length (the functions "GetLength" and "GetMax" return these values). The CONSTRUCTOR Init and the DESTRUCTOR Done complete the set of methods.

A queue is a FIFO list, but a list of what? Since we want our program to be as abstract as possible, we've defined a "generic item" object type. This type has no data fields and only a DESTRUCTOR meth-

Make a program really
abstract by defining
a "generic item" object
type with no data
fields and only a
DESTRUCTOR method.

od. It is thus of no use at all by itself, but you can make *any* object a descendant of GenericItem. And any such object can be queued up with the QUEUES Unit. Indeed, you'll note that the queue object *itself* is a descendant of the GenericItem type, which means you can easily have a queue of queues!

Computer queues model real queues, of course, so the BANK.PAS program listed in Figure 10 simulates the familiar line in front of a teller's window. First it defines PatronItem as a descendant of GenericItem. The only important fact about bank patrons in this simulation is how much time they spend at the teller window—their TaskTime. The Init procedure for this type of item sets the TaskTime to a random value that falls between the specified minimum and maximum.

Although we could now simply declare an instance variable of the object type "queue" and manipulate it, that wouldn't be proper object-oriented style. Instead, we define a "Bank" object whose data fields are a queue and several fields that define the simulation. The initialization



TURBO PASCAL PROFESSIONAL 5.5 VS. QUICKPASCAL 1.0: A COMPARISON

This chart compares the features of Borland's new Turbo Pascal Professional 5.5 (the "Professional" package includes the Turbo Debugger with support for objects) with those of Microsoft's QuickPascal 1.0.

In terms of basic capabilities, there is very little difference between the two compilers: nearly anything you can do in one, you can do just as well in the other. The QuickPascal Integrated Development Environment gives it certain advantages, like its multiple windows and color-coded Pascal source. QP's built-in debugging has some useful features that Turbo Pascal users won't get

unless they get the Turbo Debugger as well.

The Turbo Debugger, on the other hand, provides substantially more power than the built-in debugging capabilities of QP. TP itself also has a number of specific advantages, starting with an excellent guide to object-oriented programming. You can compile larger programs in TP without resorting to the command-line compiler, and if your programs get really big, you can overlay them. Moreover, the TP linker is smart enough to strip out unused data, methods, and ancestor objects, which can mean a substantial reduction of code size compared with QP's.

	Quick-Pascal	Turbo Pascal 5.5	Turbo Pascal Professional 5.5
COMPILER			
286-specific code	■	□	□
Amount of EMS usable for swap during compile	1MB	0	0
Amount of EMS usable for edit buffer	0	64K	64K
Compile/run to memory	□	■	■
Compile/run to disk	■	■	■
Works with one-floppy systems	□	■	■
Works with dual-floppy systems	■	■	■
Smart linker strips unused:			
Data	□	■	■
Procedures and functions	■	■	■
Static methods	□	■	■
Ancestor objects	□	■	■
Generates overlaid programs	□	■	■
Debugs overlaid programs	□	■	■
Can place objects in overlays	□	■	■
Supports in-line machine code	■	■	■
Supports assembler subroutines	■	■	■
Integrated debugging ASM subroutines	■	□	□
EDITOR AND ENVIRONMENT			
Multiple overlapping windows	■	□	□
Multiple views of the same source file	■	□	□
Resizable windows	■	□	□
Can maximize, minimize, and move windows	■	■ (limited)	■ (limited)
Number of source windows that can be open	9	1	1
Visible bookmarks	Unlimited	4	4
Can reconfigure keyboard	■	■	■
Block indent/unindent	■	■	■
Editing/searching operations work in all windows	■	□	□
File printing	■	■	■
Easy/Full Menus option	■	□	□
Compile, edit, and debug are integrated	■	■	■
Can change directory without leaving environment	□	■	■
Single key to save a file	□	■	■
Single key to load a file	□	■	■
Single key to compile a file	□	■	■
Displays pick list of files	□	■	■
Remembers for last 8 files (including across sessions):			
Cursor position	□	■	■
Block markers and bookmarks	□	■	■
Search strings	□	■	■
Color-coded keywords comments, and strings	■	□	□

■ —Yes □ —No

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DEBUGGER

Integrated debugger and editor
Support for standalone debugger
Maximum program size
Source-level debugging
Single-step:
 Into procedures/functions
 Around procedures/functions
 Into objects
Animation
Can watch local and global variables
Can watch objects, variables, and expressions
Evaluates and modifies objects and variables
Evaluates user functions and object methods
Number of break points
Hardware break points
Conditional break points (global or tied to statement):
 On expression true
 On data value change
 On pass count
Break triggers logging to file
Break triggers splice code
Call stack
Call stack shows actual parameters
Display CPU registers and flags
Object hierarchy browser
Object inspectors
Object method dispatching from debugger
Debug overlaid programs
386-virtual-machine debugging
Remote debugging
Data debugging
Session logging
Keystroke macros
Multiple overlapping debug windows
Generates standard .MAP files

HELP

Single-key access to help
Point-and-shoot access to help
Point-and-shoot mouse access to help
Hypertext help inside environment
Hypertext help in standalone editor
Context-sensitive help for entire environment
Help on Pascal language
Help on standard functions and procedures
Help on error messages
Gives syntax error number and message
Gives runtime error number and message
Help linked to examples

Lab Notes

[illegible]

	Quick-Pascal	Turbo Pascal 5.5	Turbo Pascal Professional 5.5
Can copy and paste examples to source window	■	■	■
Cross-references:			
Explicit links	■	■ (limited)	■ (limited)
Implicit links	■	□	□
Scrollable, searchable	■	□	□
Retrace screens	20	20	20
DOCUMENTATION			
Quick-start reference	■	□	□
Computer-based training on environment	■	■	■
User guide to programming in Pascal	■	■	■
Object-oriented programming tutorial	□	■	■
Reference guide	□	■	■
EXAMPLES			
Object-oriented programming libraries included	□	■	■
Source code for OOP libraries included	□	■	■
Number of OOP examples	1	7	7
Lines of OOP examples	548	12,478	12,478
Disk space required by all examples	143K	473K	473K
UNITS			
TP 5.5 units (objects, forms)	□	■	■
TP5 units (overlay)	□	■	■
TP4 units (system, CRT, DOS, printer)	■	■	■
TP3 units (Turbo3, Graph3)	□	■	■
BGI (graphics)	■ (limited)	■	■
MSgraph graphics unit	■	□	□
CGA, EGA, VGA, Hercules support	■	■	■
Windows-compatible character fonts	■	□	□
Real-world coordinate system	■	□	□
Source code available	□	■	■
OBJECT-ORIENTED PROGRAMMING			
Inheritance	■	■	■
Static objects	□	■	■
Dynamic objects	■	■	■
Static methods	□	■	■
Virtual methods	■	■	■
Object constants	□	■	■
Constructors	□	■	■
Destructors	□	■	■
Perform object-oriented I/O (streams)	□	■	■
Container objects	□	■	■
External methods (assembler)	□	■	■
COMPATIBILITY			
With Turbo Pascal 5.5	■ (limited)	■	■
With Turbo Pascal 5.0	■	■	■
With Turbo Pascal 4.0	■	■	■
Turbo Pascal 3 compatibility unit	□	■	■
8087 coprocessor support	■	■	■
8087 emulation in software	□	■	■
BGI graphics	■ (limited)	■	■
Multiple circular unit references	■ (limited)	■	■
Maximum number of units	80	Unlimited	Unlimited
FLOATING POINT			
Extended precision with 8087 present	■	■	■
Extended precision without 8087	□	■	■
Optimized 6-byte reals	□	■	■

Lab Notes

method sets the average time between patrons and the range of task lengths. The "Tick" method simulates tenths of a minute in the bank. To run the simulation, the main program just calls Tick repeatedly until either 60 simulated minutes have passed or the user presses a key.

Polymorphism is what makes the Queues Unit work here. The enqueue method expects a pointer to GenericItem, but it happily accepts a pointer to PatronItem instead, since PatronItem is a descendant. The dequeue function returns a pointer to GenericItem, but we can successfully typecast it to a PatronPtr.

While polymorphism is one important aspect of object-oriented programming, another is illustrated by what happened

while I was writing the QUEUES Unit. I made a subtle error, such that under certain circumstances the program ended up disposing of an already disposed pointer—with disastrous results. I fixed the error, of course, but I won't have to worry about making that error again. I won't make it because I won't need to rewrite the code again: I can reuse the QUEUES Unit in various programs as needed. This important point cannot be overemphasized: object-oriented code is reliable because you can reuse it without modification.

OBJECTS IN YOUR FUTURE

Although not written in an object-oriented language, Borland's Turbo Debugger is an example of a program written using object-oriented concepts. All of its display windows are descendants of a generic window

Changes to one
object minimally affect
other objects, so
there's less chance that
fixing one bug
will create another.

type. Each type "knows" how to display itself, what to display, and how to close itself. So it was relatively easy for the Borland coders to extend the Debugger to understand the object-oriented extensions of TP 5.5.

As more programmers start using object-oriented tools, that kind of *extensibility* will become commonplace. Encapsulating program details within objects lets the programmer concentrate on the big picture of the program. Objects are building blocks—reliable, modular, and extensible building blocks. Changes to one object have minimal side-effects on other objects, so there's less chance that fixing one bug will create another. By building object-oriented programs from well-tested standard components, we'll be able to produce more code and fewer bugs—a worthy goal for us all. ■

Neil J. Rubenking is a contributing editor of PC Magazine.

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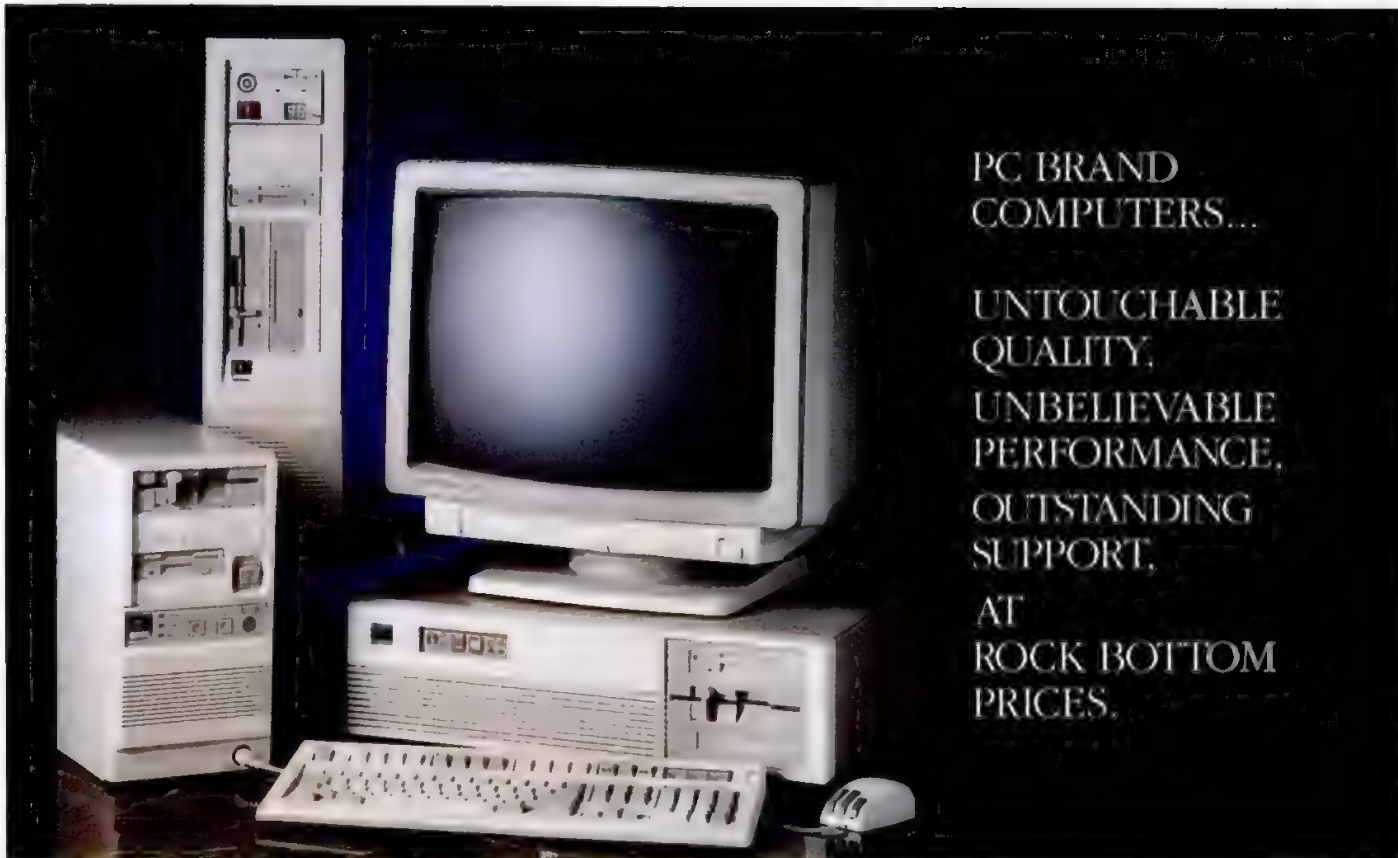


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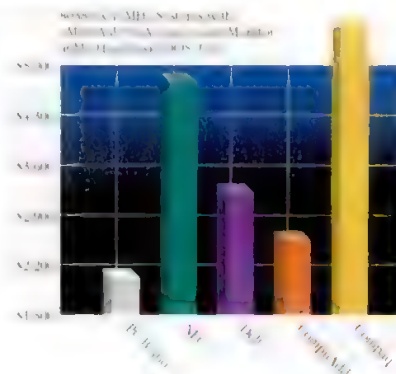
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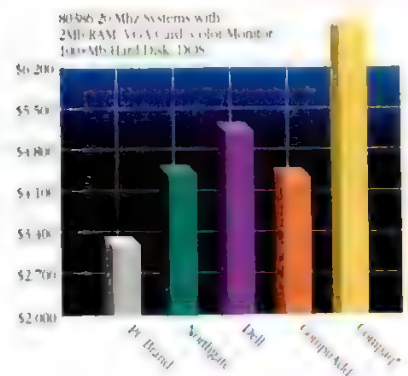
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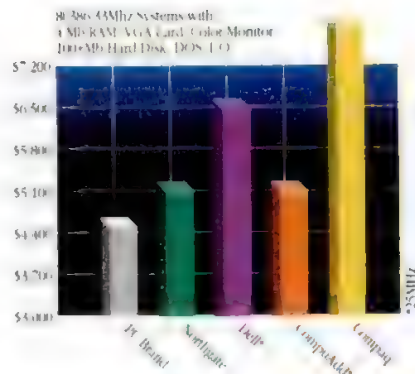
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Actual VGA PLASMA Screen Image

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by
Neil J. Rubenking

Utilities

PC Magazine Utilities columns are designed to enhance both your productivity and your programming skills. By themselves, this issue's game programs are simply for amusement. For programmers, however, games are often the best teachers of technique. So while the rest of the office is losing virtual quarters to Video Poker, concentrating on Concentration, or relaxing with Go Fish, you could be learning about object-oriented programming in Turbo Pascal 5.5.

Video Poker machines are hot in Las Vegas, as every Comdex veteran knows. The game is a variation of five-card draw poker. A player bets anywhere from one to five quarters, gets his cards, and marks the ones that he wants to hold. When you're ready, the machine takes your discards and deals as many new cards as needed. There's no more betting; the machine calculates the value of your hand and pays off right away.

For multiplayer relaxation, I chose to implement the children's game Go Fish. When it's your turn, you pick any other player and ask—by rank—for any card of which you already have one. If the other player has any, he gives them to you and you play again. If not, you "go fish"—that is, you draw a card from the deck.

Each time you ask for a nine, for example, you reveal to the other players that you have at least one nine yourself. The other players also learn whether the player you've asked has any. Clever players remember what the others have revealed. And just to provide a little more adult challenge, you can choose to let the computer cheat in its answers.

When you accumulate four of a kind, you remove them from your hand and score one point. The game ends when all of the cards have been collected into sets of four, and the player with the highest score wins.

You can download the executable programs from PC MagNet, as explained in

Learn Object-Oriented Programming While You Play Video Poker

■ A variety of ready-to-play games illustrate new Pascal techniques that programmers can use to do more than just amuse.

the sidebar "VPOKER by Modem." Concentration and several additional games not discussed here in detail will be on PC MagNet as well.

Because of space considerations, we are unable to print most of the source code, however it is available for downloading. You can also get the listings by mail or fax by sending a written request with your name, address, and fax number (if applicable) to Utilities, *PC Magazine*, One Park Avenue, New York, NY 10016; Attention: Carolyn Falconer. No phone calls please.

If this is your first exposure to object-oriented programming in Pascal, look over the source code carefully. It's a whole new style of programming whose modularity and reusable code provide major advantages. It's vastly easier to create large programs or multiprogrammer projects when each module is totally self-contained. Moreover, as you build up libraries of objects, each successive project requires less new programming.

How can you learn this new programming style? Textbooks and classes have their place, but only when you try using them will you really grasp programming

concepts. First, turn to this issue's Lab Notes and study my general discussion of object-oriented programming. Next, pick a generally useful object, like a generic linked list, and create it. Then use it in a few simple programs to fine-tune your implementation.

You also could study examples of object-oriented source code, such as those supplied with Turbo Pascal 5.5. Then you could use or modify the sample code in programs of your own. The set of objects we'll create here for Video Poker can be used for writing computerized card games in general, and the Go Fish game illustrates specifically how to implement them in a multiplayer game.

OBJECT-ORIENTED CONCEPTS

Encapsulation, inheritance, and polymorphism are the key concepts in object-oriented programming (OOP). *Encapsulation* denotes the fact that an object contains both data fields and methods—namely, procedures and functions—that act on that data.

Although object-oriented Pascal won't prevent you from doing so, in proper OOP you never access data fields *except* through methods. Since "outside" routines don't affect the "inside" of an object, this makes debugging easier. And when you fix a buggy method, your repairs are not likely to cause side effects elsewhere in the program.

"A zebra is a horse, except it has stripes." When you consider such a statement, your concept of "zebra" *inherits*

Utilities

everything that you know about horses and adds the stripes.

Inheritance works the same way for objects in programming. When you declare one object to be the *descendant* of another, you create a new object that inherits all of the data fields and methods of its ancestor. Moreover, the new object can add data fields or methods, and it can override existing methods. An object can have many descendants, but only one ancestor: the result is an inherent tree-structured hierarchy.

In object-oriented programming, there are two kinds of methods—*virtual* and *static*. (Note, however, that unlike Turbo Pascal, QuickPascal doesn't allow static methods.) The compiler calls a *static*

method in the same fashion that it calls any ordinary procedure—it simply generates a direct call to the appropriate address. But a *virtual* method call is indirect. With this second method, the compiler generates a call to whatever address is in the appropriate slot in the VMT (Virtual Method Table). As a result, the compiler doesn't know which routine will be called, but it knows where it will be able to find the right address.

Combine this "blessed ignorance" with the fact that a pointer to an object can legally point to any of the object's descendants and you'll get *polymorphism*. Your program can call an object's method without knowing the exact type of the object. It could be a descendant object that hadn't even been imagined when the program itself was compiled. All that matters is that it has a virtual method at the proper place in the VMT.

Why wouldn't you declare every method virtual? After all, QuickPascal does. The main reasons are size and speed. A static method call is fractionally faster because it skips the indirection via the VMT. And an object that doesn't require any virtual methods will save the space used by the VMT, and by the VMT pointer, in every object instance. In the sample code in this article, I'll try to strike a balance between the advantages of static and virtual methods.

The code examples presented here are all written for Turbo Pascal 5.5. It's not practical to write for both Turbo Pascal and QuickPascal, and Turbo Pascal has certain advantages. The extended syntax it provides for *NEW*, for example, makes it possible to add a node to a linked list in one statement; QuickPascal would require four statements and a temporary variable. If you wish to translate the sample programs

VPOKER BY MODEM

The programs published in *PC Magazine* are available by modem from PC MagNet.

To join PC MagNet, set your communications software for either 300 or 1,200 bits per second, 7 data bits, even parity, 1 stop bit, and full duplex. To find the number nearest your dialing exchange, dial (800) 346-3247. When the modem connects, press Enter. At the HOST NAME prompt, enter PHONES. Follow the menus and note the number closest to you.

After you have found the phone number nearest, you hang up and redial using that number. When you connect with PC MagNet, press Ctrl-C. At the HOST NAME prompt, enter CIS. At the USER ID prompt, enter 177000,5000. Enter PC*MAGNET at the PASSWORD prompt and Z10D9004 at the ENTER AGREEMENT NUMBER prompt. For Customer Service, call (800) 848-8990; outside the United States, call (614) 457-8650.

To download VPOKER.EXE, PLAYFISH.EXE, CONCEN.EXE, their Pascal listings, and associated files, log on to PC MagNet. Enter GO UTILITIES or choose PC MAGAZINE UTILITIES from the top menu, then DIRECT UTILITY DOWN-

LOAD from the next menu. Enter the filename, then select the file you want to download from those presented. Answer yes (Y) to DO YOU WISH TO DOWNLOAD? Press Enter to see the transfer protocols. Choose a protocol and download the file.

You don't have to be a member of CompuServe to access PC MagNet. It costs \$12.80 an hour for 1,200/2,400-bps service and \$6.30 for 300-bps, via MasterCard, VISA, or American Express. These programs can be copied but are copyrighted and are made available only for noncommercial use. You may make copies for others as long as no charge is involved, but making copies for any commercial purpose is prohibited.

Like all good software, the programs presented in *PC Magazine* are upgraded and improved. The only way to obtain the modified versions is to download them from PC MagNet. Here is a partial list of the programs that have been upgraded to fix minor bugs and system incompatibilities:

ANSI.COM, Version 1.3
BEN51.EXE (benchmark tests, Version 5.1)
CARDFILE.COM, Version 1.1
CHKFRAG.EXE, Version 1.2 (now works with volumes larger than 32MB)

DIRMATCH.COM, Version 1.1
EMS40.SYS, Version 1.1 (fixes a problem that EMS40 had with Lotus 1-2-3)
LITES.COM, Version 1.1
LOG.COM, Version 1.1
PCMANAGE.EXE, Version 1.1
RN.COM, Version 2.0 (now works under DOS 4.x)
SLICE.COM, Version 1.3
SNIPPER.COM, Version 1.2
ZCOPY.COM, Version 1.2

For a complete list of all the programs available from the PC MagNet Utilities Database, download UDCAT.ARC.

A downloadable index to *PC Magazine*'s product reviews is also available. PCM.EXE is a self-extracting file that contains Computer Library's *PC Magazine Reviews Index* for January 1988 to June 1989. This easy-to-use database is a subset of the Computer Library periodicals database, which is available on CD-ROM and on PC MagNet. It requires the search files in PCSRCH.EXE.

PCSRCH.EXE is a self-extracting archive containing the software used to retrieve citations from the *PC Magazine Reviews Index*. Please read the information file PCM.INF before you download any of these files. ■

Utilities

for QuickPascal, see the sidebar on translation in my Lab Notes on object-oriented Pascal.

EXAMINING THE UNIT CARDS.PAS

The object-oriented Pascal extensions can be useful in all varieties of programming, but they're especially appropriate for simulations. In fact, the early object-oriented languages were created for that purpose. Because computer card games are designed to simulate playing cards in real life, the card-playing objects must be directly related to the physical objects.

The main objects in the Unit CARDS.PAS, listed in Figure 1, are Card, Pile, Deck, Hand, Player, and Game. Each has data fields and methods that allow it to behave like its corresponding physical object. The Player and Game objects are purposely incomplete because every game will need different rules and different abilities for its players.

The unit CARDS.PAS also contains a handful of non-method routines that are used in the example games. Thus, for example, the Frame Procedure provides a rectangular area on the screen, and other

non-method routines provide different sounds. Because of smart linking, these routines won't take any code space in programs that never call them.

On-screen a card

object can draw, hide, or point to itself.

The methods DrawAt, HideAt, PointTo, and UnPoint determine the card's status using X and Y coordinates supplied by the calling procedure.

THE CARD OBJECT

What's important about a card object? Its face is either up or down, it may have a

particular location, and it has a specific value—two of clubs or queen of hearts, for example. But wait: if you're playing Milles Bornes, the card values are quite different—ones such as "Green Light" or "Flat Tire." Thus, while the basic Card object is properly oriented to the regular 52-card deck, we represent the card's value by a Word data field in order to build in a certain amount of flexibility. Methods interpret that word into rank and suit for the 52-card deck.

All the objects in the Cards unit observe strict encapsulation. None of them peek to see the other objects' data. If another routine needs to know about a particular instance of the Card object, the functions GetValue, GetRank, and GetSuit will return its value, either directly or interpreted according to suit and rank. TurnUp and TurnDown set the value of the FaceUp field, and PutInPlace sets the X and Y coordinates. Other objects should get access to a Card's data fields only via these methods.

There are four methods that handle the card's on-screen representation. A card can draw itself, hide itself, and point to itself. The methods DrawAt, HideAt, PointTo, and UnPoint use X and Y coordinates, which are supplied by the calling procedure. These are useful in a Hand of

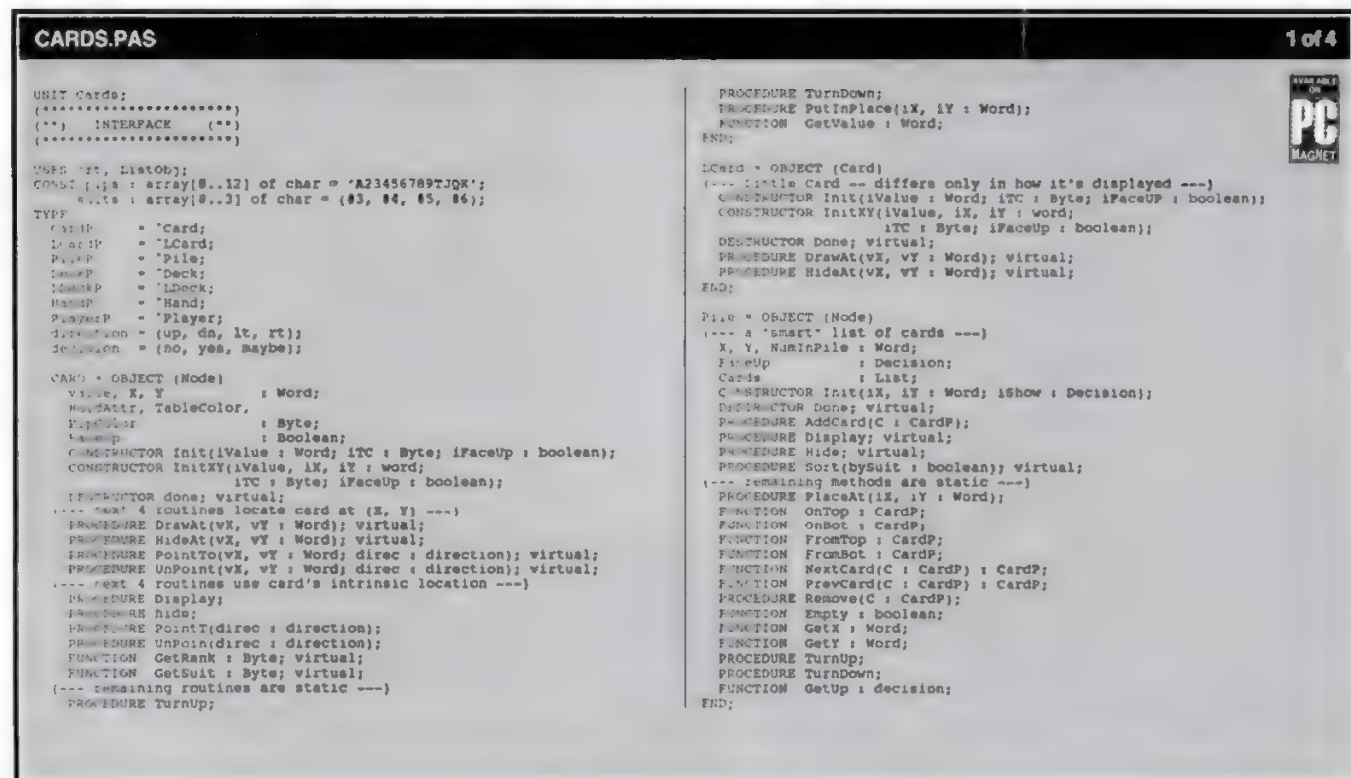


Figure 1: This listing contains all the object types necessary to write a card-playing program.

Utilities

cards, in which the coordinates change as you sort the hand. The Display, Hide, PointT, and UnPoint methods perform the same tasks, but these methods use the card's intrinsic location. For example, Display simply calls DrawAt using the Card's own x and y fields. As a result, only the first four methods need to be virtual: Display will always call the appropriate virtual DrawAt method for the particular Card type.

The LCard object is just like a Card, except that it's little. From that description, you can correctly assume that LCard is a descendant of Card. LCard differs from its ancestor only in its DrawAt and HideAt methods. Naturally, the LDeck object is a Deck of little Cards. While the game examples here don't use any LCards, if you download the code for this article, you'll find that the Concentration game does.

THE PILE OBJECT AND ITS DESCENDANTS

When you play cards, you start with a pile called the *deck*. Some games use a discard

pile, and each player has a pile of cards in hand. The Pile object is a "smart" linked list of Cards. It uses the generic List object from the unit LISTOBJ.PAS (available on PC MagNet) to store a list of CardPs—that is, pointers to Card. You can store any type of object in a List, as long as it descends

The benefits of
modular programming
outweigh the overhead
of numerous calls.

from the Node object (which is also defined in LISTOBJ.PAS). All a Node has is a Next field and a method to skim through the circular linked list to the Previous pointer. Pile itself is a descendant of Node, because some games may require a list of Piles.

The AddCard method adds a Card pointer to a Pile. Note again that this may

point to any descendant of Card. Hide and Display conceal and show the Pile on-screen. Descendants of Pile will have different representations on the screen, so these methods are virtual.

The Sort method that is shown here is specifically geared to a standard 52-card deck. As written, it's a simple selection sort, which is adequate for the fairly small linked lists of cards in a Pile. Descendants of Pile might replace it with a more efficient sort, or with one based on a different type of Card.

A Pile's FaceUp field is not quite the same as that for a Card. Specifically, the former has three values: No, Yes, and Maybe. If FaceUp is No, all cards added to the pile will be turned face down; the reverse is true if it's Yes. If it's Maybe, the orientation of added cards won't be changed. In the popular Klondike solitaire game, for example, some cards are up and some are down in the same pile—that's a Maybe pile. Methods TurnUp and TurnDown change the orientation of a pile. They don't flip the cards already in the pile, but simply change its orientation for any added cards.

The remaining methods are static, and

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CARDS.PAS

2 of 4

```

Hand = OBJECT (pile)
{--- a hand is a pile with the cards spread out ---}
px, py : Byte; {used in pointing to cards}

direc : direction;
CONSTRUCTOR Init(ix, iy : Word; ishow : decision;
                 idire : direction);
DESTRUCTOR Done; virtual;
PROCEDURE Display; virtual;
PROCEDURE Hide; virtual;
PROCEDURE PointToCard(CP : CardP; dr : direction); virtual;
PROCEDURE UnPointCard(CP : CardP; dr : direction); virtual;
{--- remaining method is "private" ---}
PROCEDURE Private_Go;
END;

Deck = OBJECT (pile)
{--- a DECK is a PILE that can shuffle ---}
CONSTRUCTOR Init(ix, iy : Word; itc : Byte);
DESTRUCTOR done; virtual;
PROCEDURE shuffle; virtual;
PROCEDURE AddToBottom(C : CardP);
END;

LDeck = OBJECT (deck)
{--- a LDECK is a DECK of little cards ---}
CONSTRUCTOR Init(ix, iy : Word; itc : Byte);
DESTRUCTOR done; virtual;
END;

Player = OBJECT (node)
{--- abstract -- each GAME needs a new player type ---}
H : HandP;
name : String;
CONSTRUCTOR Init(ix, iy : Word; ishow : decision;
                 idire : direction; iName : String);
DESTRUCTOR Done; virtual;
PROCEDURE TakeCard(C : CardP); virtual;
PROCEDURE ShowHand; virtual;
PROCEDURE PointToMe; virtual;
PROCEDURE UnPointMe; virtual;
{--- remaining methods are static ---}
FUNCTION GetName : String;
FUNCTION OutOfCards : Boolean;
FUNCTION NextNotSelf(L : list; X : PlayerP) : PlayerP;
FUNCTION PrevNotSelf(L : list; X : PlayerP) : PlayerP;
FUNCTION FirstNotSelf(L : list) : PlayerP;
END;

Game = OBJECT
{--- abstract object -- every game will differ ---}
D : deckP;
TableColor : Byte;
players : list;
whoseturn : PlayerP;
CONSTRUCTOR Init(itc : byte);
DESTRUCTOR done; virtual;
PROCEDURE DealCards(num : word); virtual;
PROCEDURE Display; virtual;
{--- remaining methods are static ---}
PROCEDURE AddPlayer(PP : PlayerP);
END;

*--non-method routines-----*

PROCEDURE Frame(x1, y1, x2, y2 : byte; {corner coords}
                typ : byte;           {type of frame}
                clr : boolean;        {clear inside?}
                clrch : char);       {clear with what}

PROCEDURE beep;
PROCEDURE click;
PROCEDURE sad;
PROCEDURE happy;
PROCEDURE fanfare;

*--IMPLEMENTATION (*)
*--non-method routines-----*

PROCEDURE Frame(x1, y1, x2, y2 : byte; {corner coords}
                typ : byte;           {type of frame}
                clr : boolean;        {clear inside?}
                clrch : char);       {clear with what}

TYPE fchars = (ulc, top, urc, side, lrc, llc);
CONST fc : ARRAY[0..2] OF ARRAY[fchars] OF CHAR =
  (
    ' ', '21881966191817982178192',
    '20182058187818681888288');
VAR
  ro, co : Byte;
  S : String[80];
BEGIN
  FillChar(S, SizeOf(S), fc[typ][top]);
  S[8] := char(pred(x2-x1));
  GotoXY(x1, y1);
  Write(fc[typ][ulc], S, fc[typ][urc]);
  GotoXY(x1, y2);
  Write(fc[typ][llc], S, fc[typ][lrc]);
  FillChar(S[1], pred(SizeOf(S)), clrch);
  FOR ro := succ(y1) TO pred(y2) DO
    IF clr THEN
      BEGIN
        GotoXY(x1, ro);
        Write(fc[typ][side], S, fc[typ][side]);

```

```

      END
    ELSE
      BEGIN
        GotoXY(x1, ro); Write(fc[typ][side]);
        GotoXY(x2, ro); Write(fc[typ][side]);
      END;
    END;

PROCEDURE SoundDel(S, D : Word); BEGIN Sound(S); Delay(D); END;

PROCEDURE beep; BEGIN SoundDel(3000, 100); nosound; END;

PROCEDURE click; BEGIN SoundDel(4000, 10); NoSound; END;

PROCEDURE sad;
VAR N : Byte;
BEGIN
  FOR N := 50 DOWNT0 1 DO SoundDel(500+20*N, 5); NoSound;
END;

PROCEDURE happy;
VAR N : Byte;
BEGIN
  FOR N := 1 TO 50 DO SoundDel(500+30*N, 5); NoSound;
END;

PROCEDURE fanfare;
BEGIN
  SoundDel(523, 200); SoundDel(698, 200);
  SoundDel(880, 200); SoundDel(1047, 200);
  NoSound; Delay(200);
  SoundDel(880, 200); SoundDel(1047, 600);
  NoSound;
END;

(*--methods for CARD-----*)

CONSTRUCTOR Card.Init(iValue : Word; itc : Byte; iFaceUp : boolean);
BEGIN
  value := iValue; TableColor := itc;
  IF value < 26 THEN PipColor := LightRed ELSE PipColor := black;
  FaceUp := iFaceUp; X := 0; Y := 0;
END;

CONSTRUCTOR Card.InitXY(iValue, ix, iy : word;
                        itc : Byte; iFaceUp : boolean);
BEGIN Init(iValue, itc, iFaceUp); X := ix; Y := iy; END;

DESTRUCTOR card.done; BEGIN END;

PROCEDURE Card.DrawAt(vX, vY : Word);
BEGIN
  HoldAttr := TextAttr;
  TextBackground(white);
  IF FaceUP THEN
    BEGIN
      TextColor(PipColor);
      frame(vX, vY, vx+4, vy+4, 1, true, ' ');
      {Write pips across AND down, so card values
       will be visible when spread horz. or vert.}
      GotoXY(vx+1, vy+2); Write(pips[GetRank]);
      GotoXY(vx+2, vy+1); Write(pips[GetRank]);
      GotoXY(vx+1, vy+3); Write(suits[GetSuit]);
      GotoXY(vx+3, vy+1); Write(suits[GetSuit]);
    END
  ELSE
    BEGIN
      TextBackground(blue); TextColor(lightgray);
      frame(vX, vY, vx+4, vy+4, 2, true, #176);
    END;
  TextAttr := HoldAttr;
END;

PROCEDURE Card.HideAt(vX, vY : Word);
BEGIN
  HoldAttr := TextAttr;
  TextAttr := TableColor;
  frame(vX, vY, vx+4, vy+4, 0, true, ' ');
  TextAttr := HoldAttr;
END;

PROCEDURE Card.PointTo(vX, vY : Word; direc : direction);
BEGIN
  HoldAttr := TextAttr;
  TextAttr := TableColor;
  CASE direc OF
    up : BEGIN; GotoXY(vx+1, vy-1); Write('#25'); END;
    dn : BEGIN; GotoXY(vx+1, vy+3); Write('#24'); END;
    lt : BEGIN; GotoXY(vx-1, vy+2); Write('#26'); END;
    rt : BEGIN; GotoXY(vx+3, vy+2); Write('#27'); END;
  END;
  TextAttr := HoldAttr;
END;

PROCEDURE Card.UnPoint(vX, vY : Word; direc : direction);
BEGIN
  HoldAttr := TextAttr;
  TextAttr := TableColor;
  CASE direc OF
    up : BEGIN; GotoXY(vx+1, vy-1); Write(' '); END;
    dn : BEGIN; GotoXY(vx+1, vy+3); Write(' '); END;
    lt : BEGIN; GotoXY(vx-1, vy+2); Write(' '); END;
    rt : BEGIN; GotoXY(vx+3, vy+2); Write(' '); END;
  END;
  TextAttr := HoldAttr;
END;

```

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```

PROCEDURE Card.Display; BEGIN DrawAt(X, Y); END;
PROCEDURE Card.Hide; BEGIN HideAt(X, Y); END;
PROCEDURE Card.PointTo(direc : direction);
BEGIN PointTo(X, Y, direc); END;
PROCEDURE Card.Unpin(direc : direction);
BEGIN Unpin(X, Y, direc); END;
FUNCTION Card.GetRank : Byte; BEGIN GetRank := value MOD 13; END;
FUNCTION Card.GetSuit : Byte; BEGIN GetSuit := value DIV 13; END;
PROCEDURE Card.TurnUp; BEGIN FaceUp := True; END;
PROCEDURE Card.TurnDown; BEGIN FaceUp := False; END;
PROCEDURE Card.PutInPlace(iX, iY : Word);
BEGIN X := iX; Y := iY; END;
FUNCTION Card.GetValue : Word; BEGIN GetValue := Value; END;

(*-methods for LCard-----*)
CONSTRUCTOR LCard.Init(iValue : Word;
  iTC : Byte; iFaceUp : boolean);
BEGIN Card.Init(iValue, iTC, iFaceUp); END;
CONSTRUCTOR LCard.InitXY(iValue, iX, iY : word;
  iTC : Byte; iFaceUp : boolean);
BEGIN Init(iValue, iTC, iFaceUp); X := iX; Y := iY; END;
DESTRUCTOR LCard.Done; BEGIN Card.Done; END;
PROCEDURE LCard.DrawAt(vX, vY : Word);
BEGIN
  HoldAttr := TextAttr;
  TextBackground(White);
  IF FaceUp THEN
    BEGIN
      TextColor(WipColor);
      GotoXY(vX, vY); Write(' ', Pipe[GetRank], ' ');
      GotoXY(vX, succ(vY)); Write(' ', Suite[GetSuit], ' ');
    END
  ELSE
    BEGIN
      TextColor(blue);
      GotoXY(vX, vY); Write($176$176$176);
      GotoXY(vX, succ(vY)); Write($176$176$176);
    END;
  TextAttr := HoldAttr;
END;
PROCEDURE LCard.HideAt(vX, vY : Word);
BEGIN
  HoldAttr := TextAttr;
  TextAttr := TableColor;
  GotoXY(vX, vY); Write(' ');
  GotoXY(vX, succ(vY)); Write(' ');
  TextAttr := HoldAttr;
END;

(*-methods for FILE-----*)
CONSTRUCTOR File.Init(iX, iY : Word; ishow : decision);
BEGIN
  X := iX; Y := iY; Cards.Init; NumInFile := 0; FaceUp := ishow;
END;
DESTRUCTOR File.Done;
BEGIN Cards.Done; END;
PROCEDURE File.AddCard(C : CardP);
BEGIN
  IF FaceUp = yes THEN C.TurnUp;
  IF FaceUp = no THEN C.TurnDown;
  Cards.Append(C); Inc(NumInFile);
END;
PROCEDURE File.Display;
BEGIN IF NOT cards.Empty THEN CardP(cards.Last).DrawAt(X, Y); END;
PROCEDURE File.Hide;
BEGIN IF NOT cards.Empty THEN CardP(cards.Last).HideAt(X, Y); END;
PROCEDURE File.Sort(bySuit : boolean);
VAR
  N, M, T : CardP;
FUNCTION greater(xM, xN : CardP) : Boolean;
VAR sm, sn, Rm, Rn : Byte;
BEGIN
  sm := xM.GetSuit;
  sn := xN.GetSuit;
  Rm := xM.GetRank;
  Rn := xN.GetRank;
  greater := false;
  IF bySuit THEN
    IF sm > sn THEN greater := true
    ELSE IF (sm = sn) AND (Rm > Rn) THEN greater := true;
  END
  ELSE
    BEGIN
      IF Rm > Rn THEN greater := true
      ELSE IF (Rm = Rn) AND (sm > sn) THEN greater := true;
    END;
  END;
BEGIN (immediate exchange selection sort)
  N := OnTop;
  WHILE N <> OnBot DO
    BEGIN
      N := OnBot;
      WHILE M <> N DO
        BEGIN
          IF Greater(M, N) THEN
            BEGIN
              Cards.SwapInList(M, N);
              T := M; M := N; N := T;
            END;
          M := NextCard(M);
          N := PrevCard(N);
        END;
      END;
    END;
  PROCEDURE File.PlaceAt(iX, iY : Word); BEGIN X := iX; Y := iY; END;
  FUNCTION File.OnTop : CardP; BEGIN OnTop := CardP(cards.Last); END;
  FUNCTION File.OnBot : CardP; BEGIN OnBot := CardP(cards.First); END;
  FUNCTION File.FromTop : CardP;
  BEGIN
    IF (NumInFile = 1) AND (X > Y) THEN
      CardP(cards.Last).HideAt(X, Y);
    FromTop := CardP(cards.Last);
    Cards.remove(cards.Last); Dec(NumInFile);
  END;
  FUNCTION File.FromBot : CardP;
  BEGIN
    IF (NumInFile = 1) AND (X < Y) THEN
      CardP(cards.First).HideAt(X, Y);
    FromBot := CardP(cards.First);
    Cards.remove(cards.First); Dec(NumInFile);
  END;
  FUNCTION File.GetX : Word; BEGIN GetX := X; END;
  FUNCTION File.GetY : Word; BEGIN GetY := Y; END;
  FUNCTION File.Empty : boolean; BEGIN Empty := cards.empty; END;
  FUNCTION File.NextCard(C : CardP) : CardP;
  BEGIN NextCard := CardP(cards.Next(C)); END;
  FUNCTION File.PrevCard(C : CardP) : CardP;
  BEGIN PrevCard := CardP(cards.Prev(C)); END;
  PROCEDURE File.Remove(C : CardP);
  BEGIN
    IF (NumInFile = 1) AND (X > Y) THEN
      CardP(cards.Last).HideAt(X, Y);
    Cards.remove(C); Dec(NumInFile);
  END;
  PROCEDURE File.TurnUp; BEGIN FaceUp := yes; END;
  PROCEDURE File.TurnDown; BEGIN FaceUp := no; END;
  FUNCTION File.GetUp : decision; BEGIN GetUp := FaceUp; END;

(*-methods for HAND-----*)
CONSTRUCTOR Hand.Init(iX, iY : Word; ishow : decision;
  idirec : direction);
BEGIN File.Init(iX, iY, ishow); direc := idirec; END;
DESTRUCTOR Hand.Done; BEGIN File.Done; END;
PROCEDURE Hand.PrivateGo;
BEGIN
  CASE direc OF
    up : Dec(pY, 2);
    dn : Inc(pY, 2);
    lt : Dec(pX, 2);
    rt : Inc(pX, 2);
  END;
END;
PROCEDURE Hand.Display;
VAR C : CardP;
BEGIN
  px := X; py := Y; C := CardP(cards.First);
  WHILE C <> NIL DO
    BEGIN
      C.DrawAt(px, py); PrivateGo;
      C := CardP(cards.Next(C));
    END;
  END;
PROCEDURE Hand.Hide;
VAR C : CardP;
BEGIN
  px := X; py := Y; C := CardP(cards.First);
  WHILE C <> NIL DO
    BEGIN

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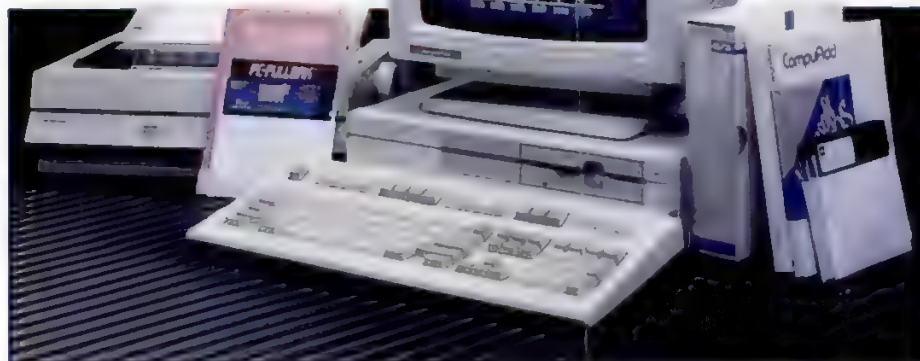
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- Color monitor optional.

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64716

Career Starter Kit Monitor And Hard Drive Options

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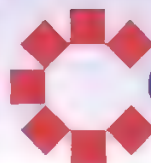
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CARDS.PAS

4 of 4

```

C^.HideAt(pX, pY); Private_Go;
C := CardP(cards.next(C));
END;

PROCEDURE Hand.PointToCard(CP : CardP; dr : direction);
VAR C : CardP;
BEGIN
  pX := X; pY := Y; C := CardP(cards.Firs);
  WHILE (C<>NIL) AND (C<>CP) DO
    BEGIN
      C := CardP(cards.next(C)); Private_Go;
    END;
  IF C <> NIL THEN C^.PointTo(pX, pY, dr);
END;

PROCEDURE Hand.UnPointCard(CP : CardP; dr : direction);
VAR C : CardP;
BEGIN
  pX := X; pY := Y; C := CardP(cards.Firs);
  WHILE (C<>NIL) AND (C<>CP) DO
    BEGIN
      C := CardP(cards.next(C)); Private_Go;
    END;
  IF C <> NIL THEN C^.UnPoint(pX, pY, dr);
END;

(*--methods for DECK-----*)

CONSTRUCTOR deck.Init(iX, iY : Word; iTC : Byte);
VAR valu : word;
BEGIN
  Pile.Init(iX, iY, no);
  FOR valu := 0 to 51 DO
    AddCard(New(CardP, Init(valu, iTC, false)));
  END;
END;

DESTRUCTOR Deck.done; BEGIN Pile.Done; END;

PROCEDURE Deck.Shuffle;
VAR N,M,T:CardP;
BEGIN
  N := OnBot;
  WHILE N <> NIL DO
    BEGIN
      M := CardP(Cards.Nth(succ(random(NumInPile))));
      Cards.SwapInList(N, M);
      T := N; N := M; M := T;
      N := NextCard(N);
    END;
  END;
END;

PROCEDURE Deck.AddToBottom(C : CardP);
BEGIN
  IF FaceUp = yes THEN C^.TurnUp;
  IF FaceUp = no THEN C^.TurnDown;
  Cards.Insert(cards.Firs, C);
  Inc(NumInPile);
END;

(*--methods for LDECK-----*)

CONSTRUCTOR LDeck.Init(iX, iY : Word; iTC : Byte);
VAR valu : word;
BEGIN
  Pile.Init(iX, iY, no);
  FOR valu := 0 to 51 DO
    AddCard(New(LCardP, Init(valu, iTC, false)));
  END;
END;

DESTRUCTOR LDeck.done; BEGIN Deck.Done; END;

(*--methods for Player-----*)

CONSTRUCTOR Player.Init(iX, iY : Word; iShow : decision;
  iDire : direction; iName : String);
BEGIN New(M, Init(iX, iY, iShow, iDire)); name := iName; END;

DESTRUCTOR Player.Done; BEGIN dispose(M, done); END;

PROCEDURE Player.TakeCard(C : CardP); BEGIN H^.AddCard(C); END;

FUNCTION Player.GetName : String; BEGIN GetName := name; END;

(*-- abstract methods ---*)
PROCEDURE Player.ShowHand; BEGIN END;
PROCEDURE Player.PointToMe; BEGIN END;
PROCEDURE Player.UnPointMe; BEGIN END;

FUNCTION Player.OutOfCards : Boolean;
BEGIN OutOfCards := H^.empty; END;

FUNCTION Player.NextNotSelf(L : List; X : PlayerP) : PlayerP;
VAR P : PlayerP;
BEGIN
  P := PlayerP(L.NextCirc(X));
  IF P = @Self THEN P := PlayerP(L.NextCirc(P));
  NextNotSelf := P;
END;

FUNCTION Player.PrevNotSelf(L : List; X : PlayerP) : PlayerP;
VAR P : PlayerP;
BEGIN
  P := PlayerP(L.PrevCirc(X));
  IF P = @Self THEN P := PlayerP(L.PrevCirc(P));
  PrevNotSelf := P;
END;

FUNCTION Player.FirsNotSelf(L : List) : PlayerP;
BEGIN
  IF L.Firs = @Self THEN
    FirsNotSelf := PlayerP(L.NextCirc(L.firs))
  ELSE FirsNotSelf := PlayerP(L.Firs);
END;

(*--methods for GAME-----*)

CONSTRUCTOR game.Init(iTC : Byte);
BEGIN
  Randomize;
  TableColor := iTC;
  players.Init; whoseturn := NIL;
  (each game inits its own DECK)
END;

DESTRUCTOR game.done; BEGIN Players.done; dispose(D, done); END;

PROCEDURE game.AddPlayer(PP : PlayerP);
BEGIN
  players.append(PP);
  IF players.Firs = players.last THEN
    whoseturn := PlayerP(players.Firs);
END;

PROCEDURE game.DealCards(num : word);
VAR N : Byte;
P : PlayerP;
BEGIN
  IF num = 0 THEN (deal 'til deck is gone)
  BEGIN
    P := PlayerP(players.Firs);
    WHILE NOT D^.empty DO
      BEGIN
        P^.TakeCard(D^.FromTop);
        P := PlayerP(players.NextCirc(P));
      END;
    END;
  END
  ELSE (deal "num" cards to each player)
  FOR N := 1 to num DO
    BEGIN
      P := PlayerP(players.Firs);
      WHILE P <> NIL DO
        BEGIN
          P^.TakeCard(D^.FromTop);
          P := PlayerP(players.next(P));
        END;
      END;
    END;
  END;

PROCEDURE game.Display; BEGIN END;
END.

```

most of them serve to get information from the pile. Functions are provided to return the top and bottom cards of the pile, either removing the card (FromTop, FromBot) or leaving it in place (OnTop, OnBot). NextCard and PrevCard return the card after or before a given card in the Pile, and Remove takes a particular card out of the pile.

These last three assume that you've specified a card that's in the pile. Of

course, the function Empty returns True only when there are no cards in the Pile.

The general Pile object has two important descendant objects: Hand and Deck. A Hand is a Pile that displays with the cards spread, as you would arrange real cards to look at them. It has a data field called Direc that specifies the direction in which it spreads out. Naturally, it has new methods for displaying on the screen. It can also point to any of its cards, so it's

easy to choose a discard for gin rummy, for example. Actually, it calls on its cards to point to themselves—that's the object-oriented way.

Hand also has a "private" method, Private_Go, which is used only by its other methods. Object-oriented Pascal doesn't implement private methods, just as it doesn't actively prevent outside routines from manipulating data fields directly. It's up to the programmer to avoid calling pri-

Utilities

vate methods from outside. My convention is to start all private-method names with `Private_`, in order to set them apart. Note that if you're distributing a compiled Unit and a list of object declarations, you can simply omit private methods from the list.

When you initialize a Deck, it gets one each of the 52 possible card values. Of course, descendants of Deck may use different sets of cards. Deck uses a kind of anti-sort to shuffle the cards: it swaps each card with another card chosen at random. In some games, discards are returned to the bottom of the deck, so Deck also includes the method `AddToBottom`.

WHAT IS A PLAYER?

If you want to play a game, you have to round up a few players. It would be impossible to provide a Player object with methods appropriate to every possible game, but there are certain fields and methods that all will require. A Player has a Hand of cards and a name. A Player object can take a card, show or hide its hand, report its name, and tell whether it's out of Cards. Given a list of players and a pointer to a player on the list, it can locate the next or previous player in the list that is not itself. This is handy for games that require the player to "consider" each of the other players in some way. Player is yet another descendant of Node, because we'll want to store lists of Players.

The Player's Constructor takes four parameters that don't initialize its own data fields. Rather, it uses them to initialize the Hand field. Once the Hand is set up, the Player object doesn't need to know its details. It simply calls on the Hand to take a card, display itself, and so on.

Each game will require its own type of Player. In most cases, there will be at least two types of players: human and computer-controlled. As you'll see in the Go Fish game, it makes sense to define a Player type that has all the necessary methods but that declares any decision-making methods as empty `BEGIN..END` pairs. The human and computer players will both descend from this object, one making decisions via the keyboard, the other using whatever algorithms you program into it. You may wish to create multiple algorithmic players and pit them against each other to see which algorithm is best.

AT LAST WE HAVE A GAME!

Take a Deck of Cards and some Players, add methods to implement the rules of play, and you have a Game. Each card game will have different rules, of course, and the Game object will contain only things common to all. It has a Deck, a list of Players, and a pointer to the player whose turn is next. Methods are provided to allow adding a player and dealing the Cards. Those are about the only things all games have in common, so that's all there is to a Game.

Cards, Piles of cards, Hands, Decks, Players, and now Games—these are the objects in CARDS.PAS. If the objects have been devised properly, it should be easy to put them together to make games. Note that once CARDS.PAS is tested and debugged, you won't have to touch it again. That's the great advantage of OOP. The objects are self-contained and have no potential side effects. If it's taken a while to get to the point of actually writing the first actual game, you'll see that it was worthwhile.

VIDEO POKER!

The card-playing objects provided here are more than adequate to simulate the video poker machine described at the beginning of this article. Indeed, we won't even require any Player types since, as with most solitaires, you'll interact directly with the game.

The Video Poker machines in Las Vegas have brightly colored graphics, roughly equivalent to the capabilities of EGA. Not everyone has EGA, however, so it makes sense to separate the game play from its representation. Thus, we create a Poker game that contains all the methods needed *except* those that display something on the screen.

Descendants of this general Poker object will display the game on a particular output device. POKER.PAS, shown in Figure 2, is the general poker game, while TPOKER.PAS (available on PC MagNet) and GPOKER.PAS, shown in Figure 3, display on text and graphics screens, respectively.

The Poker object is a descendant of Game. For data fields, it has a layout of five cards and a Boolean array that indicates which cards you've chosen to hold. It stores your stake of quarters, and it also has several "margin" fields that help locate the layout on-screen.

Not unnaturally, Poker's main method is `Play`. `Play` implements all the steps a

Video Poker machine goes through in playing one game. For any events that require screen output, `Play` calls a virtual method. In POKER.PAS, these screen methods are all empty `BEGIN..END` pairs that will be filled in by the descendant objects. After a round, the `Analyze` method decides what your cards were worth, and `Play` adjusts your stake accordingly. Note that it would be possible to create a Poker object in which the input routines, like the output routines, were separate virtual methods. That would make it easy to write a version that would accept mouse input or input from a touch-screen.

TPOKER.PAS, which is shown running in Figure 4, shows how simple it is to create the TextPoker object: a descendant of Poker that displays in text mode. Its Constructor establishes a deck of standard text-mode cards and sets the margins so the cards will display ten columns apart, starting at column 20, row 10. The `Display` method lists the payoffs and sets up the playing table. Add some simple methods to display messages on the screen and it's done! The algorithmic smarts are all in POKER.PAS, so TPOKER has only about 80 lines of code.

GOING FOR GRAPHICS

While the TextPoker object works fine, Video Poker is obviously an application that cries out for graphics. If you have EGA or better, you'll want to use the GraphicPoker object instead.

The first thing a graphics-mode video poker game needs is some graphics-mode Cards. GCARDS.PAS (available on PC MagNet) contains the declarations for a graphical card object. A GCard has several new data fields: pointers to bitmaps for large and small pips, and a pointer to an array that determines where the pips should be located on the card.

The Unit also defines a record type to store graphics settings. Borland's BGI graphics commands use global variables to determine line style, text justification, fill type, and so on. The routines that display graphical cards have to save all of these settings, do their work, and then restore them. Otherwise they wouldn't be self-contained. Borland could do the world a favor by rewriting the BGI commands to work with object-oriented Pascal!

The only GCard methods that have to be overridden are those that actually display something on the screen. `DrawAt` must show the front or back of the card, and `HideAt` must erase it in graphics

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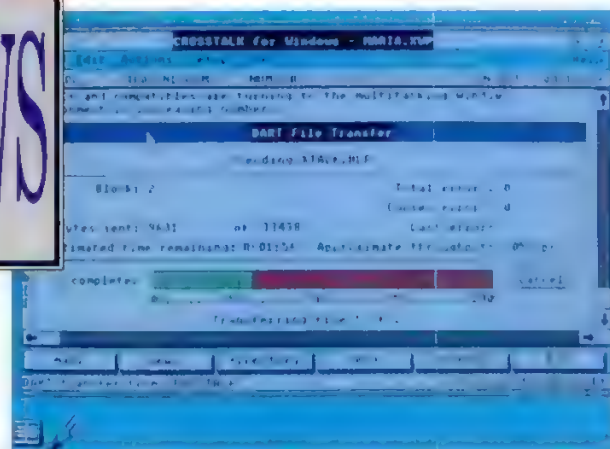
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POKER.PAS

1 of 2



```

UNIT POKER;
(*****
(**) INTERFACE (***)
(*****
USES Crt, Cards;
TYPE
  Message = String[40];
  PokerHand = (nothing, JacksOrBetter, TwoPair, ThreeOfAKind,
    straight, flush, FullHouse, FourOfAKind,
    StraightFlush, RoyalFlush);
  PokerGame = OBJECT (game)
    layout : array[0..4] of CardP;
    Hold : array[0..4] of Boolean;
    stake : Longint;
    margin, tab,
    topmargin : word;
    CONSTRUCTOR Init(IRC : Byte);
    DESTRUCTOR Done; virtual;
    FUNCTION NameScore(P : PokerHand) : String;
    FUNCTION Analyze : PokerHand;
    PROCEDURE Play(VAR again : boolean);
  (--- output methods ---)
    PROCEDURE AskForBet;
    PROCEDURE TellHowToHold;
    PROCEDURE TellWhatchaWon(S : Message);
    PROCEDURE YouBusted;
    PROCEDURE Display; virtual;
    PROCEDURE ClearBottom; virtual;
    PROCEDURE ShowStake; virtual;
    PROCEDURE HoldButton(B : Byte); virtual;
    PROCEDURE Tell(M1, M2 : Message); virtual;
  END;
(*****
(**) IMPLEMENTATION (***)
(*****

CONST Payoff : ARRAY (PokerHand) OF byte =
  (0, 1, 2, 3, 4, 6, 9, 25, 50, 250);

CONSTRUCTOR PokerGame.Init(IRC : byte);
BEGIN
  Game.Init(IRC);
  FillChar(layout, SizeOf(layout), 0);
  stake := 40;
END;

DESTRUCTOR PokerGame.Done; BEGIN game.Done; END;

FUNCTION PokerGame.Analyze : PokerHand;
VAR
  val0, suit : Array[0..4] of byte;
  same1, same2,
  N, M, P : Byte;
  IsF, IsS : boolean; {IsFlush and IsStraight}
BEGIN
  FOR N := 0 TO 4 DO
    BEGIN
      val0[N] := layout[N].GetRank;
      suit[N] := layout[N].GetSuit;
    END;
    {Sort the values into order}
    FOR M := 4 DOWNTO 1 DO
      FOR N := 0 TO pred(N) DO
        IF val0[N] > val0[M] THEN
          BEGIN
            P := val0[M]; val0[M] := val0[N]; val0[N] := P;
          END;
        IF IsF := true; IsS := true; {-- true 'til proven false --}
        FOR M := 1 TO 4 DO IF suit[M] <> suit[0] THEN IsF := false;
        FOR M := 1 DOWNTO 1 DO IF val0[M+1]-val0[M]<>1 THEN IsS := false;
        IF IsS THEN IsS := val0[1]-val0[0] IN [1, 9];

        IF IsF THEN
          BEGIN
            IF IsS THEN
              IF val0[1] = 10 THEN Analyze := RoyalFlush
              ELSE Analyze := StraightFlush
              ELSE Analyze := Flush;
            EXIT;
          END;
        IF IsS THEN BEGIN Analyze := Straight; EXIT; END;

        {-- no straight, so flush, try same-rank hands --}
        same1 := 0; same2 := 0;
        FOR N := 0 TO 3 DO
          IF val0[N] = val0[succ(N)] THEN
            BEGIN
              inc(same1);
              P := val0[N];
            END;
        END;
        IF same1 > 2 THEN
          FOR M := 0 TO 4 DO IF val0[M] = P THEN inc(same2);
        CASE same1 OF
          0 : Analyze := nothing;
          1 : IF P IN [0, 10, 11, 12] THEN Analyze := JacksOrBetter
            ELSE Analyze := Nothing;
          2 : CASE same2 OF
              2 : Analyze := TwoPair;
              3 : Analyze := ThreeOfAKind;

```

Figure 2: Because different users will have different video displays, the general POKER.PAS program does not include Methods for screen display.

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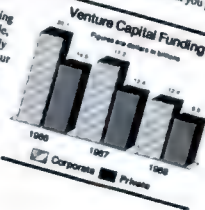
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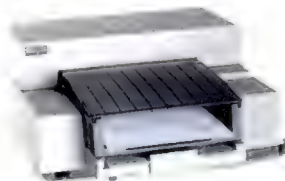
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POKER.PAS

2 of 2

```

BEGIN
  WITH layout[N] DO BEGIN TurnDown; Hide; END;
  D.AddCard(layout[N]);
END;
IF stake <= 0 THEN
  BEGIN
    YouBusted;
    IF ReadKey = 00 THEN;
    Exit;
  END;
  again := true;
END;

PROCEDURE PokerGame.TellWhatchaWon(S : Message);
BEGIN Tell(S, ''); END;

PROCEDURE PokerGame.YouBusted;
BEGIN Tell('Sorry, friend, you're busted!', ''); END;

```

```

PROCEDURE PokerGame.AskForBet;
BEGIN Tell('Play 1 to 5 quarters', 'Press <Esc> to quit'); END;

PROCEDURE PokerGame.TellHowToHold;
BEGIN
  Tell('SPACERBAR turns HOLD on/off', 'ENTER when ready to draw');
END;

--- output methods -- abstract ---
PROCEDURE PokerGame.Display; BEGIN END;
PROCEDURE PokerGame.ClearBottom; BEGIN END;
PROCEDURE PokerGame.ShowStake; BEGIN END;
PROCEDURE PokerGame.HoldButton(B : Byte); BEGIN END;
PROCEDURE PokerGame.Tell(M1, M2 : Message); BEGIN END;
END.

```

GPOKER.PAS

COMPLETE LISTING

```

PROGRAM GPoker;
USES Crt, Cards, Graph, Drivers, Fonts, GCards, poker;
TYPE
  GraphicPoker = OBJECT (PokerGame)
    CONSTRUCTOR Init(ITC : Byte);
    DESTRUCTOR Done; virtual;
    PROCEDURE Display; virtual;
    PROCEDURE ClearBottom; virtual;
    PROCEDURE ShowStake; virtual;
    PROCEDURE HoldButton(B : Byte); virtual;
    PROCEDURE Tell(M1, M2 : Message); virtual;
  END;

CONSTRUCTOR GraphicPoker.Init(ITC : Byte);
VAR
  grDriver : Integer;
  grMode : Integer;
  ErrCode : Integer;

  PROCEDURE ErrorOut(what : String);
  BEGIN WriteLn('Error in ', what, ' loading. '); Halt(1); END;

BEGIN
  PokerGame.Init(ITC);
  TableColor := ITC;
  grDriver := EGA; grMode := EGAM;
  IF RegisterBGIDriver(EGAVGA driverProc) < 0 THEN
    ErrorOut('EGAVGA driver');
  IF RegisterBGIFont(TriplexFontProc) < 0 THEN
    ErrorOut('Triplex font');
  IF RegisterBGIFont(SmallFontProc) < 0 THEN
    ErrorOut('Small font');
  IF RegisterBGIFont(SansSerifFontProc) < 0 THEN
    ErrorOut('SansSerif font');
  InitGraph(grDriver, grMode, '');
  ErrCode := GraphResult;
  IF ErrCode <> grok THEN
    BEGIN
      WriteLn('Graphics error : ', GraphErrorMsg(ErrCode));
      Halt(1);
    END;
  D := New(GDeckP, Init(8, 0, tableColor));
  D.Shuffle;
  margin := 38; tab := 128; topmargin := 128;
END;

PROCEDURE GraphicPoker.Display;
BEGIN
  SetBkColor(tableColor);
  SetPalette(brown, black);
  SetColor(white);
  Rectangle(2, 8, 639, 349);
  SetTextStyle(TriplexFont, HorizDir, 7);
  SetTextJustify(CenterText, BottomText);
  OutTextXY(328, 58, 'VIDEO POKER');
  SetTextJustify(LeftText, BottomText);
  SetColor(brown);
  Rectangle(328, 265, 633, 346);
  SetFillStyle(solidFill, white);
  SetTextStyle(SmallFont, HorizDir, 4);
  SetColor(brown);
  OutTextXY(325, 288, 'Jacks or better');
  OutTextXY(325, 299, 'Two pair');
  OutTextXY(325, 310, 'Three of a kind');
  OutTextXY(325, 321, 'Straight');
  OutTextXY(488, 288, 'Flush');
  OutTextXY(488, 299, 'Full house');
  OutTextXY(488, 310, 'Four of a kind');
  OutTextXY(488, 321, 'Straight flush');
  OutTextXY(488, 332, 'Royal flush');
  SetTextJustify(RightText, BottomText);
  SetColor(LightRed);
  OutTextXY(478, 288, '1-1');

```

```

OutTextXY(478, 299, '2-1');
OutTextXY(478, 310, '3-1');
OutTextXY(478, 321, '4-1');
OutTextXY(622, 288, '6-1');
OutTextXY(622, 299, '9-1');
OutTextXY(622, 310, '25-1');
OutTextXY(622, 321, '58-1');
OutTextXY(622, 332, '250-1');
END;

DESTRUCTOR GraphicPoker.Done;
BEGIN PokerGame.Done; CloseGraph; END;

PROCEDURE GraphicPoker.ClearBottom;
BEGIN
  SetFillStyle(solidFill, GetBkColor);
  Bar(1, 265, 319, 348);
END;

PROCEDURE GraphicPoker.ShowStake;
VAR S : String[40];
BEGIN
  Str(8.25*stake:1:2, S);
  SetFillStyle(solidFill, Brown);
  Bar(188, 68, 468, 188);
  SetColor(white);
  SetTextStyle(TriplexFont, HorizDir, 4);
  Rectangle(188, 68, 468, 188);
  SetTextJustify(RightText, BottomText);
  OutTextXY(458, 98, '8*8');
  SetTextStyle(TriplexFont, HorizDir, 2);
  SetTextJustify(LeftText, TopText);
END;

PROCEDURE GraphicPoker.HoldButton(B : Byte);
BEGIN
  IF Hold[B] THEN
    BEGIN
      SetFillStyle(solidFill, white);
      SetColor(Red);
      Bar(38*8*128, 238, 138*8*128, 255);
      Rectangle(38*8*128, 238, 138*8*128, 255);
      OutTextXY(48*8*128, 232, 'H O L D');
      SetColor(white);
    END
  ELSE
    BEGIN
      SetFillStyle(solidFill, GetBkColor);
      Bar(38*8*128, 238, 138*8*128, 255);
    END;
  END;

PROCEDURE GraphicPoker.Tell(M1, M2 : Message);
BEGIN OutTextXY(18, 288, M1); OutTextXY(18, 318, M2); END;

VAR
  V : GraphicPoker;
  again : boolean;
BEGIN
  V.Init(blue);
  V.Display;
  REPEAT
    V.Play(again);
  UNTIL NOT again;
  V.Done;
END.

```



Figure 3: This program provides for the display of POKER.PAS on graphics screens, as shown in Figure 5.

Utilities

mode. PointTo ignores direction—it just puts a rectangle around the pointed-to card. The inherited methods Hide, Display, PointT, and UnPoin automatically call the GCard versions of the screen procedures. And a GDeck, of course, is simply a deck of GCards.

To compile the GPOKER.PAS listing shown in Figure 3, you'll have to download the source files from PC MagNet. The card pips come from bitmaps stored in .OBJ files, and we just can't print these here. You'll also need the DRIVERS.TPU and FONTS.TPU. (These come with Turbo Pascal 5.5.) Read and run the program BGILINK.PAS, also supplied with Turbo Pascal, to create these Units. Their purpose is to compile the EGA video driver and fonts directly into the program, rather than keep them as external files.

The GraphicPoker object in GPOKER.PAS differs only slightly from the TextPoker object. It needs a few more lines of code because the Constructor has to initialize the appropriate graphics mode. The Constructor creates and shuffles a deck of GCards, and it sets the margins so that the cards will appear every 120 pixels, starting at column 30, row 120.

Display draws a much nicer video poker screen than the one for TPOKER. The result is shown in Figure 5. Again, all that's left is to implement the various messages to the user. We now have a complete Video Poker machine replica. The only thing missing is some way to make quarters come out of the slots in the front of the computer. If anyone solves that one, contact me in care of *PC Magazine*.

POLYMORPHIC PLAYERS IN GO FISH

Video Poker is pretty, but it takes a true multiplayer game to exercise our objects fully. In GOFISH.PAS (available on PC MagNet), a FishPlayer has methods that correspond to most of the activities I described at the outset. It has to ChooseOpponent, ChooseCard, and AskFor it. If the opponent does HaveAny, he must GiveTo the player who asked. All these methods are called by the main TakeTurn method. The object can also Show its hand, PointTo itself, report its current Score, and report what cards it has Revealed.

The FishPlayer object has empty methods for ChooseOpponent and ChooseCard. These are decision-making methods

and will be implemented differently for the computer and human players. The human player picks an opponent and a card using the keyboard, and the computer just picks at random. The ShowHand method used by the human player has been modified to sort the cards before showing them.

The Fish game object doesn't add any methods to the generic Game—it just overrides Display and Play. It adds a data field, NumLeft, which is the number of incomplete four-card sets. Play repeatedly calls the Player pointed to by the WhoseTurn field. The player object modifies NumLeft when a set of four is achieved, and it returns a Boolean that tells whether it gets to play again. If the player had to go fish, the Play method would advance the WhoseTurn pointer to the next player. This continues until all 13 sets are matched (that is, NumLeft equals 0).

In order to play the game, the various

objects have to communicate. To choose an opponent, for example, a player needs to know who the other players are. To draw a card, it needs access to the deck. You might be tempted to declare these as global variables that any object could read or change. Resist the temptation!

If an object needs access to a particular data field, pass it a pointer to that field. Fish passes each player a pointer to the list of players and a pointer to the deck. Each player keeps its own internal record of what cards it has revealed and reports this on demand. That's the object-oriented way. When you handle communication between objects without violating encapsulation, you get a robust program.

The GOFISH unit contains the complete Go Fish game and two kinds of players. The main program, PLAYFISH.PAS (available on PC MagNet), uses GOFISH, but through the power of polymorphism it

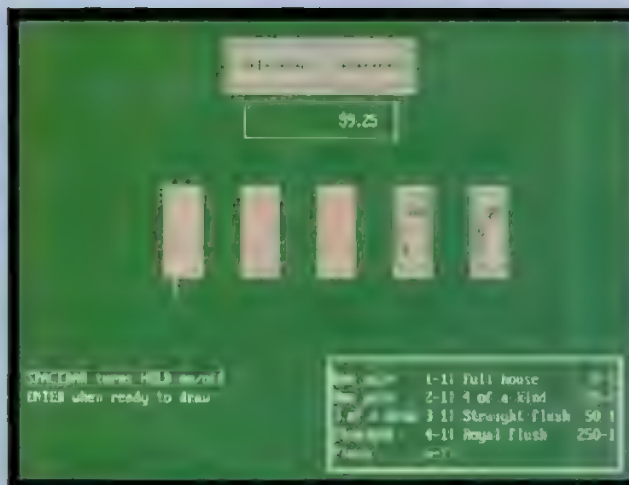


Figure 4:
TPOKER.PAS
provides the output
shown here and is
suitable for display
in text mode.



Figure 5: If your
setup has EGA or
VGA, the
GraphicPoker
object created by
GPOKER.PAS is
obviously a more
satisfactory
simulation of a
Video Poker
machine.

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CIRCLE 742 ON READER SERVICE CARD

Utilities

introduces three entirely new types of FishPlayers. The Bright player is a computerized player that makes its plays based on what the other players have Revealed. The Cheat is a Bright player, but if you ask for a card it has, half the time it lies and says "Go fish" anyway. And the Shadow is a Bright player that has the power to cloud men's minds—it doesn't maintain its list of revealed cards. Figure 6 shows what the screen to select players and the actual playing screen look like.

PLAYFISH lets you choose the names and types of two to four players and then start a game of Go Fish. If you choose a human player, you'll get to play the computer yourself. Alternatively, you can set up an all-computer game and see which algorithm is best (all of them win occasionally). PLAYFISH can also be your "template" for writing other games. Study it, tear it apart, make changes—and you'll understand object-oriented programming.

PROGRAMMING POINTERS

Object-oriented programming is a very different approach from standard procedural programming. Until many of us are doing it, there won't be clear standards. But for now, I have a few suggestions.

The first thing to do is sketch out an object hierarchy. Objects should be of a manageable size; if you can't keep in mind all the things an object does, split it into two levels in the hierarchy. Spread the smarts around—put intelligence into all the levels. If you're not sure how to set up your objects, implement simple programs using what you've got. If you've omitted a method, or placed one in the wrong object, the problem quickly becomes clear.

For each of your objects, create a pointer type. You'll be using pointers a lot, because a pointer to one object type can point to any descendant of that type. Adopt a standard convention for pointer names; I always append a P, so the name for a pointer to Card, for example, would be CardP.

You may initially be horrified by the number of "one-liner" methods. Don't cringe at writing tiny functions that simply return the current value of data fields. Methods do tend to be short. The assumption in object-oriented programming is that the benefits of robust, modular programming far outweigh the slight added overhead of numerous calls to tiny methods.

Once an object is finished and debugged, freeze it. If you need more abilities, extend it with descendants. Of course, if there's a very basic change to the nature of the object, you can make the change at the top level and it will affect all descendants.

Don't implement anything twice. If two objects share several methods, either make one a child of the other or create a parent object that contains the shared methods and has empty methods for those that differ. You should certainly consider separating any representation of an object on-screen from its algorithms, as in the poker game example.

WHAT'S NEXT?

If you've always wanted to write a card game, now's the time to start. Set up descendant Player objects with methods to play the game. Give the descendant Game object methods to implement rules and

scoring. If you're writing a game that needs a complex algorithm to make the computer play, try it first by playing both sides yourself or using a simple-minded algorithm. After you've got the game structure worked out, you can then go back and improve the algorithm. In the Go Fish game, for example, I started with a player that made choices at random and then created a smarter descendant. Play different algorithms against each other to see which works best.

You're not restricted to the standard 52-card deck. Add jokers if you like, or create a pinochle deck. The graphics cards are rather large, so you may want to draw some smaller ones. These are easy modifications to the Card object. If you're artistic, create a VGA Tarot deck, with beautiful pictures on the cards, and have your computer tell fortunes. One thing it's sure to predict is that object-oriented programming is in your future! ■



Figure 6: These two displays show the player selection screen and the actual playing screen for the Go Fish game. Note that the selection screen offers three computerized players: Bright, Cheat, and Shadow.

MANAGEMENT

General Machining and Tool Company Fiscal Year Ending 1999

Balance Sheet	January	February	March	April	May	June	July	August	Sept.
Assets									
Current Assets									
Cash & Equivalents	\$10,000	\$15,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000
Accounts Receivable	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Inventory	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Other Current Assets	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Total Current Assets	31,000	36,000	31,000	31,000	31,000	31,000	31,000	31,000	31,000
Fixed Property & Equipment	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
Less Accumulated Depreciation	(15,000)	(15,000)	(15,000)	(15,000)	(15,000)	(15,000)	(15,000)	(15,000)	(15,000)
Total Fixed Property & Equipment	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000	60,000
Total Assets	\$91,000	\$96,000	\$91,000	\$91,000	\$91,000	\$91,000	\$91,000	\$91,000	\$91,000
Liabilities									
Current Liabilities									
Accounts Payable	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Other Current Liabilities	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Total Current Liabilities	11,000	11,000	11,000	11,000	11,000	11,000	11,000	11,000	11,000
Long-Term Liabilities									
Notes Payable	80,000	85,000	80,000	80,000	80,000	80,000	80,000	80,000	80,000
Total Liabilities	\$91,000	\$96,000	\$91,000	\$91,000	\$91,000	\$91,000	\$91,000	\$91,000	\$91,000

General Machining and Tool Company - Sales Forecast

Forecasting Details	January	February	March	April	May	June	July	August	Sept.
Initial Cash Investment	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000
Private Participation Fee	12,000	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
After Tax Participation Fee	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Private Discount Rate	12.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
After Tax Discount Rate	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
After Tax Rate	0.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
Cost of Sales	30%	30%	30%	30%	30%	30%	30%	30%	30%
Cost of Sales 1 Cost	\$2,500	\$2,500	\$2,500	\$2,500	\$2,500	\$2,500	\$2,500	\$2,500	\$2,500
Cost of Sales 2 Cost	0	0	0	0	0	0	0	0	0
Cost of Sales 3 Cost	0	0	0	0	0	0	0	0	0
Interest Expense	0	0	0	0	0	0	0	0	0
Marginal Income Tax Rate	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%	25.00%
Depreciation	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
Other Noncash Expenses	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
State Principal Payments	20,000	20,000	20,000	20,000</					

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by
Charles Petzold

Environments

A curious incident took place during a baseball game last summer. The third baseman was having a bad day, and a man in the stands was continually harassing him. Fed up, the third baseman finally said to the man, "You think you can do better? Why don't you come down and play?"

As the man came down onto the field, the third baseman gave up his glove and went up into the stands. The man put on the glove and took his stance. The next hit was straight down the third base line. The man went for the ball and tripped over his own feet. The second ball rolled right through his legs. He made contact with the third ball, but it bounced off the tip of his glove.

Finally, the man threw the glove down in disgust and glared at the third baseman in the stands: "You have this base so messed up," he shouted, "that nobody can play it."

MESSED UP

At a *Microsoft Windows* development seminar I attended several years ago, someone at Microsoft confessed that the company had concentrated on video graphics and left the printer stuff for last. That was why the printer code wasn't quite as good. I get the same impression with the Presentation Manager.

I have a Hewlett-Packard ColorPro plotter on my desk, and I have a PLOTTERS.DRV driver that is supposed to support this plotter. Yet none of the sample printing code distributed by Microsoft and IBM worked with it. (I don't know if this code has been fixed in the OS/2 1.2 versions of the toolkits because I haven't seen them yet.) Indeed, not even the OS/2 1.1 File System program would print a file to my plotter, though the OS/2 1.2 File Manager can do it.

The problem with these programs lay in taking a faulty approach to obtaining a device context for a driver that, like PLOTTERS.DRV, supports multiple devices. IBM and Microsoft had the Presentation Manager printer logic so messed up that

Printing Under the OS/2 Presentation Manager, Part 2

■ Implementing printing routines in PM programs can be a positively Byzantine experience. This column will guide you through the process.

neither they nor anyone else could play it. The subject of this column is opening a device context for a printer in OS/2 Presentation Manager. In theory, this crucial step should be easy. It's not. I'll give you a *working* function that opens a device context for the default printer. The function is neither long nor complex, but I've spent many long and complex hours getting it right and getting it working. Why didn't I just extract some code from sample programs distributed in the Microsoft and IBM toolkits for OS/2 1.1? Because none of those programs worked right either! The routine I'll provide here at least will work with PLOTTERS.DRV.

THE DC AND PS

If you've been doing some Presentation Manager programming, you're already familiar with the "presentation space," or PS. You need a presentation space before you can draw on a window. In one sense, the presentation space is simply a data structure internal to GPI. This structure is used mostly to store all the current drawing attributes.

Small PM programs usually obtain a handle to a presentation space by calling

WinGetPS or WinBeginPaint with a NUL second parameter. The presentation space handle is the first parameter of virtually all GPI functions. These two functions obtain what is called a "cached micro PS," which is a presentation space that has been precreated and is ready for use.

To use a presentation space for drawing, it must be associated with a "device context," or DC. The device context refers to a physical output device and its driver. You don't have to worry about the device context when you use a cached micro-PS because the cached micro-PS is always associated with a device context for the video display.

As an alternative, a program can create its own presentation space by calling GpiCreatePS. Indeed, it must do so in order to print. You can associate this presentation space with a device context either for a window on the video display or for a printer. When you create a presentation space using GpiCreatePS, you must also open a device context and associate the PS with the DC.

Opening a device context for a window is simple. You call WinOpenWindowDC. The only parameter is a handle to a window. The function returns a handle to a device context for the window:

```
hdc = WinOpenWindowDC (hwnd) ;
```

Opening a device context for a printer is not so simple. The function you must call is DevOpenDC, but before you call DevOpenDC you must set up at least one data structure (and possibly two) describing the

Environments

printer you want to use.

You set up these data structures using information stored in the OS2SYS.INI file (in OS/2 1.2) or the OS2.INI file (in OS/2 1.1). This information is stored in these files either by the Print Manager (in OS/2 1.2) or by the Control Panel (in OS/2 1.1) when the user configures a printer. Regardless of which file holds the information and how it gets there, you use the WinQueryProfileString function to retrieve it.

THE DEFAULT PRINTER

Data stored in OS2.INI and OS2SYS.INI is referenced using two ASCII strings: an application name and a key name. The data can be either in ASCII or binary format. The data we need concerning printers is stored in an ASCII format.

You'll recall from my discussion of printer configuration in the last issue that a printer name (a 32-character string) identifies a unique parallel or serial output port, one or more printer drivers (of which one is the default), and one or more printer queue names (of which one is the default). In addition, the user selects a default printer name.

One reason why opening a device context for a printer is so difficult is that there are so many options. I'll illustrate the most "normal" way to open a device context for the default printer.

You are able to obtain the name of the default printer simply by calling WinQueryProfileString with an application name of "PM_SPOOLER" and a key name of "PRINTER". Strangely enough, the printer name is stored with an appended semicolon. Because the printer name can be 32 characters long, the semicolon and terminating zero byte thus require an array of 34 characters:

```
CHAR achDefPrnName[34];
```

You call WinQueryProfileString with the following parameters:

```
WinQueryProfileString (hab,
    "PM_SPOOLER", "PRINTER", "",
    achDefPrnName,
    sizeof achDefPrnName);
```

The second and third parameters are the application name and the key name. The

fourth parameter is a default string if the application name and key names cannot be found.

The terminating semicolon must be replaced with a zero byte. You can do that like this:

```
if ((pchDelimiter = strchr
    (achDefPrnName, ';')) != NULL)
    *pchDelimiter = '\0';
```

Now the printer name of the default printer is stored in achDefPrnName, and we're ready to proceed.

THE PRINTER DATA STRING

The Print Manager also stores important data on all the printer names in OS2SYS.INI using an application name of "PM_SPOOLER_PRINTER" and a key name, which is the printer name. You need a character array to store this data:

```
static CHAR achPrnData[256];
```

Using the name of the default printer, you then use this code to obtain the data:

```
WinQueryProfileString (hab,
    "PM_SPOOLER_PRINTER",
    achDefPrnName,
    ";;;", achPrnData,
    sizeof achPrnData);
```

Following this call, the achPrnData array will contain a zero-terminated character string, which I'll refer to as the "printer data string." This string contains four items separated by semicolons. Any or all of the four items could be empty, so in the most extreme case, the string could consist simply of four semicolons in a row. You'll note that this is the default string I've specified in the WinQueryProfileString call if the application name or key name cannot be found in OS2SYS.INI.

The first item in the printer data string is

the physical output port to which the printer is connected. This is a standard OS/2 device name such as LPT1 or COM2. This item is generally ignored by a Presentation Manager program.

The second item contains the presentation driver filename, but without the .DRV extension. For example, if you have installed the IBM 5152 Graphics Printer as your default printer, the presentation driver is IBM5152.DRV and the field would contain IBM5152.

If the presentation driver supports more than one device (as PLOTTERS.DRV does) then this second item will contain the presentation driver name, a period, and a

To open a device context for a printer in the Presentation Manager, you must first set up data structures that describe the printer you will be using.

device name. For example, if your default printer is the Hewlett-Packard ColorPro (Model 7440A) plotter, which is supported by PLOTTERS.DRV, the field would contain

PLOTTERS.HP7440A

Note that although the PostScript and Epson drivers also support multiple devices,

DEVOPENSTRUC

COMPLETE LISTING

typedef struct _DEVOPENSTRUC

PSZ	pszLogAddress ;	// logical address
PSZ	pszDriverName ;	// driver name
PDRIVDATA	pdriv ;	// DRIVDATA structure
PSZ	pszDataType ;	// spooled data type
PSZ	pszComment ;	// file description
PSZ	pszQueueProcName ;	// queue processor name
PSZ	pszQueueProcParams ;	// queue parameters
PSZ	pszSpoolerParams ;	// spooler parameters
PSZ	pszNetworkParams ;	// network parameters
}		
DEVOPENSTRUC ;		

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Figure 1: The DEVOPENSTRUC structure required by the DevOpenDC function.

Environments

these drivers handle that capability differently. The driver names would appear simply as PSCRIPT or EPSON.

It is possible for the second item to list more than one presentation driver (or presentation driver and device name). If so, these are separated by commas, as follows:

```
IBM5152,PLOTTERS.HP7440A
```

If there are multiple presentation drivers associated with a printer name, the first one listed is the default.

The third item contains one or more queue names, separated by commas. The first is the default.

The fourth item contains network options. This field is generally ignored by the Presentation Manager program doing the printing.

To illustrate, here are two sample achPrnData arrays that could be obtained from the WinQueryProfileString function shown above. The first indicates an IBM 5152 printer attached to LPT2 with a queue name of LPT1Q:

```
LPT2;IBM5152;LPT1Q;;
```

The second string shows a Hewlett-Packard 7440A ColorPro Plotter and an IBM 6186 Model 1 Color Plotter, both of which are attached to the COM1 port and have a queue name of COM1Q. The Hewlett-Packard plotter is the default:

```
COM1;PLOTTERS.HP7440A,PLOTTERS
.IBM6186-1;COM1Q;;
```

THE DEVOPENDC FUNCTION

Now that we've seen what information is available from the OS2SYS.INI file, let's look at what the DevOpenDC function requires to open the printer device context.

DevOpenDC has seven parameters. The first parameter is the anchor block handle returned from WinInitialize. The second is a constant that begins with the prefix OD. We'll be using OD_QUEUED. This indicates that the printer output is to be queued by the Presentation Manager spooler.

The third parameter to DevOpenDC is not yet interpreted by OS/2. It is recommended that you use the character string "*" for this parameter.

DRIVDATA

COMPLETE LISTING

```
typedef struct _DRIVDATA // driv
{
    LONG cb; // size of structure in bytes
    LONG lVersion; // driver version
    CHAR szDeviceName[32]; // output device name
    CHAR achGeneralData[1]; // data specific to device
}
DRIVDATA;
```



Figure 2: The DRIVDATA structure referenced by the DEVOPENSTRUC structure.

PRINTDC.C

COMPLETE LISTING

```
/*
PRINTDC.C -- Function to open device context for default printer
*/

#define INCL_WIN
#include <os2.h>
#include <mt/string.h> // note: multithread header file
#pragma pack(1) // align structure fields on 1-byte boundaries

HDC OpenDefaultPrinterDC (HAB hab)
{
    static CHAR achPrnData[256];
    static DRIVDATA driv = { sizeof (DRIVDATA) };
    CHAR achDefPrnName[34], *pchDelimiter;
    DEVOPENSTRUC dop;

    // Obtain default printer name and remove semicolon
    WinQueryProfileString (hab, "PM SPOOLER", "PRINTER", ";",
        achDefPrnName, sizeof achDefPrnName);

    if ((pchDelimiter = strchr (achDefPrnName, ';')) != NULL)
        *pchDelimiter = '\0';

    if (achDefPrnName[0] == '\0')
        return DEV_ERROR;

    // Obtain information on default printer
    WinQueryProfileString (hab, "PM SPOOLER PRINTER", achDefPrnName,
        ";;;", achPrnData, sizeof achPrnData);

    // Parse printer information string
    if ((pchDelimiter = strchr (achPrnData, ';')) == NULL)
        return DEV_ERROR;

    dop.pszDriverName = pchDelimiter + 1;

    if ((pchDelimiter = strchr (dop.pszDriverName, ';')) == NULL)
        return DEV_ERROR;

    dop.pszLogAddress = pchDelimiter + 1;

    *(dop.pszLogAddress + strcspn (dop.pszLogAddress, ",;")) = '\0';
    *(dop.pszDriverName + strcspn (dop.pszDriverName, ",;")) = '\0';

    // Fill DRIVDATA structure if necessary
    if ((pchDelimiter = strchr (dop.pszDriverName, '.')) != NULL)
    {
        *pchDelimiter = '\0';
        strncpy (driv.szDeviceName, pchDelimiter + 1,
            sizeof (driv.szDeviceName));
        dop.pdriv = &driv;
    }
    else
        dop.pdriv = NULL;

    // Set data type to "raw"
    dop.pszDataType = "PM_Q_RAW";

    // Open printer device context
    return DevOpenDC (hab, OD_QUEUED, "*", 4L, (PDEVOPENDATA) &dop, NULL);
}
```



Figure 3: The PRINTDC.C file that opens a device context for the default printer.

Environments

The fourth parameter indicates the number of items (up to nine) supplied in the fifth parameter. The fifth parameter—although not exactly defined this way in the DevOpenDC function template—is a pointer to a structure of type DEVOPENSTRUC. This structure is defined in OS-

2DEF.H and is shown in Figure 1.

(In the DevOpenDC function template, the fifth parameter is actually defined as data of type PDEVOPENDATA, which is defined as an array of pointers to character strings. This is an alternative method of supplying the information.)

Except for the pdrv field, all the fields in the DEVOPENSTRUC structure are pointers to character strings. The pdrv field is a pointer to another structure, this

one of type DRIVDATA. This structure is defined in PMDEV.H and is shown in Figure 2. This structure is required only when using a presentation driver that supports more than one device (such as PLOTTERS.DRV).

The last DevOpenDC parameter is a handle to a device context. When opening a printer device context, you set this parameter to NUL. If all goes well, DevOpenDC returns a handle to an open device context. If an error occurs, DevOpenDC returns DEV_ERROR (which equals 0).

SETTING UP THE STRUCTURE FIELDS

In preparation for calling DevOpenDC, you need to define three variables:

```
DEVOPENSTRUC dop ;  
DRIVDATA driv ;  
HDC hdcPrinter ;
```

Using the information in the printer data string obtained from the OS2.INI (or OS-2SYS.INI) file, you set the fields in the



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DevOpenDC, the
function in the PM that
opens the printer
device context, has
seven parameters that
the user must define.

DEVOPENSTRUC and DRIVDATA structures and call DevOpenDC to open the printer device context. You need to set only the first four fields of the DEVOPENSTRUC structure. Thus, the lCount parameter to DevOpenDC is set to 4L.

You set the first four DEVOPENSTRUC fields as follows:

- Set the pszLogAddress field to the queue name, for example, the string "LPT1Q" or "COM1Q". This is the third item in the printer data string returned from WinQueryProfileString. If there are multiple queue names, use the first.
- Set the pszDriverName field to the name of the presentation driver (for example, the string "IBM5152" or "PLOTTERS"). This is the second item in the

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Environments

printer data string returned from WinQueryProfileString. If there are multiple presentation drivers, use the first. If the presentation driver supports more than one device, the presentation driver name in the printer data string will be followed by a period and the device name. You use only the

presentation driver name in the pszDriverName field of the DEVOPENSTRUC structure. (This is the point at which most sample printing code flunks out.)

- If the presentation driver supports only one device, set the pdrv field to NULL. Otherwise, set it to a pointer to a DRIVDATA structure.

- Set the pszDataType field to the string "PM_Q_RAW".

If the presentation driver supports more

The actual code to extract the information from the printer data string and use it for the structure fields involves some C string functions and pointer manipulation.

than one device, then you must also initialize a DRIVDATA structure:

- Set the cb field to the length of the DRIVDATA structure.

- Set the lVersion field to 0.

- Set the szDeviceName to the name of the device (for example, "HP7440A"). This is available in the second item of the printer data string returned from WinQueryProfileString, separated by the preceding presentation driver name with a period.

- Set the abGeneralData field to contain a single zero byte.

After you have set the fields of the DEVOPENSTRUC and DRIVDATA structures, you call DevOpenDC:

```
hdcPrinter = DevOpenDC (hab,
OD_QUEUED, "", 4L,
(DEVOPENDATA) &dop, NULL);
```

Notice that the pointer to the DEVOPENSTRUC structure is cast to a PDEVOPENDATA data type. This is how the fifth parameter is defined in the DevOpenDC function template, so the casting prevents the issuance of a warning message from the C compiler.

THE PRINTDC.C FILE

The actual code to extract the information from the printer data string and use it for the structure fields involves some C string functions and pointer manipulation. This is shown in a function called OpenDefaultPrinterDC in the PRINTDC.C file listed in Figure 3.

In the OpenDefaultPrinterDC function in PRINTDC.C, the first WinQueryPro-

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fileString call obtains the name of the default printer and stores it in achDefPmName. The second call to WinQueryProfileString obtains the printer data string and stores it in achPmData. The first item of this string (containing the physical device port) is ignored. The second item contains the presentation driver name. The function sets the pszDriverName field of the DEVOPENSTRUC structure to point to this name. The third item is the queue name, and the function sets the pszLogAddress field of the DEVOPENSTRUC structure to point to this name. The fourth item is ignored.

A period following the presentation driver name indicates that the presentation driver supports more than one device. The function copies the name of this device to the szDeviceName field of the DRIVDATA structure using strncpy. (The strncpy function is needed because the szDeviceName field is not a pointer to a character string but an array of characters.) The pdrv field of the DEVOPENSTRUC structure is set to point to the DRIVDATA structure.

Finally, the OpenDefaultPrinterDC function sets the pszDataType field of the

Despite the recommendation that you use "PM_Q_STD", there are actually several drawbacks to using this data type for some presentation drivers.

DEVOPENSTRUC structure to the string "PM_Q_RAW" and calls DevOpenDC.

You may have read recommendations in the IBM and Microsoft Presentation Manager programming guides that you use "PM_Q_STD" for the pszDataType field rather than "PM_Q_RAW". In the last is-

sue I noted that printer output could be stored in a disk file for spooling either in a device-independent format (standard) or already converted to printer control codes (raw). This parameter specifies that.

Despite the recommendation that you use "PM_Q_STD", there are actually several drawbacks to using this data type for some presentation drivers. Only "PM_Q_RAW" allows us full flexibility in the GPI functions we use on the printer.

STAY TUNED

Now that you've seen how to open a printer device context, I think you'll agree that it is one of the trickiest aspects of a program that prints under the OS/2 Presentation Manager. And there are still obstacles ahead. For example, it's a good idea for PM programs to create a second thread of execution for printing. I will show you how to tackle this and other printer-related problems in the next two issues. ■

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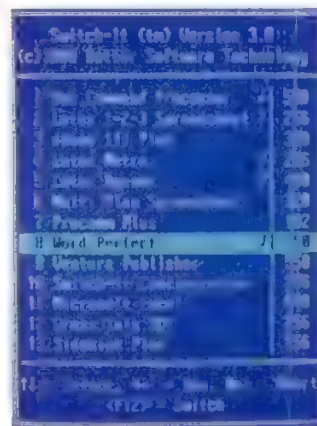
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Spreadsheets

WHEN WORDS MEAN NOTHING

The reader submissions in this issue's column revolve around a common theme: how spreadsheet programs handle text in numeric formulas. There's quite a lot of inconsistency in this matter, even between versions of the same program. *Lotus 1-2-3's* Release 2.01 and 2.2, for example, do not agree on what to do with a text expression in a numeric formula. Disagreements like this can produce compatibility problems in shops that use both versions.

After discussing the text/formula relationship, I will conclude the column with a quick revisit to the static-date macro published in the September 12, 1989, column. This seems to be in order, since quite a few readers wrote in about it.

A LOTUS BUG?

I think I have found a bug in *Lotus 1-2-3*: the program assigns a value of 0 to labels referenced in the range of statistical functions—a glitch that sometimes interferes with the results of a formula. For example, when I use @MAX with a range that contains only negative numbers and labels, the function returns 0 rather than the highest negative number.

L.P. Gougeon
Troy, New York



1-2-3 accepts text cells within the arguments of its statistical functions. Unfortunately, rather than ignoring the labels, the spreadsheet treats them as though they were numeric cells with the value 0. So not only will the @MAX function return an erroneous 0 when all the numbers in the argument are negative, but @MIN will return a 0 when all the numbers are positive.

Although it can be annoying, the problem is not really dangerous when using @MAX and @MIN: if 0 is returned as the highest value in a list of negative numbers or the lowest value in a list of positive numbers, you could probably catch the error by eyeballing the list. However, when a label cell skews the result of an @AVG,

■ Mixing labels and formulas can yield a handy trick or a spreadsheet nightmare. The letters in this issue discuss the relationship from both sides.

@COUNT, @STD, or @VAR function, the mistake can easily be overlooked. But wait: the situation gets even more complicated if not perilous.

While blank cells have no effect on statistical functions, cells that contain even just a label prefix character (blank *label* cells) do affect results. But it's difficult to tell an empty label cell from a truly blank one without a worksheet mapping or auditing tool; you have to move the pointer to each address in question and inspect its contents.

There is a way for you to ensure correct results when using statistical functions and to exclude nonnumeric values from @COUNT. The standard—albeit rather inelegant—solution is to use a database statistical function in place of the standard one: @DMAX instead of @MAX, for example.

Consider the following sample data that mixes numeric and text cells:

	A
1	-1
2	-12
3	home
4	-75
.	.
.	.
.	.
99	-57
100	car

In order to find the maximum value in a range of data, place a field heading directly above the column, set up a criterion range somewhere else in the worksheet, and use

@ISNUMBER as the criterion formula; @ISNUMBER will select only the numeric values from the input column. At this point, your worksheet looks something like this:

	A	B	C	D	E
1	Fieldname		Fieldname		
2	-1		@ISNUMBER(B5)		
3	-12				
4	home				
5	-75				
.	.				
.	.				
.	.				
99	-57				
100	car				

Now you can use the formula @DMAX-(A1..A100,0,C1..C2) to get the highest numeric value in your column.

Though this procedure solves the problem, it has some limitations. It doesn't work at all in Release 1A, which lacks an @ISNUMBER function. More importantly, however, the input range must fall within a single contiguous column. Consequently, to analyze multiple ranges and make sure your results aren't thrown off by errant label cells, you must rearrange your worksheet, write a macro to blank out any text cells in the area you want to examine, or just exercise caution.

Ultimately, Lotus should have fixed this deficiency long ago. But apparently it regards *1-2-3's* text handling in statistical function arguments as, if not a virtue, at least a liability it doesn't dare unload. All versions of the spreadsheet, from Sachs and Kapor's original to Release 3.0, behave the same way. Scott Tucker, one of the principal architects of Release 3, shed some light on the issue: compatibility with Release 2.x was such an important consideration in the design of Release 3 that Lotus was unwilling to make its statistical functions ignore text cells. Tucker said that if they had chosen to modify this aspect of Release 3, they would have created a whole new parallel set of statistical func-

Spreadsheets

tions, so that users who exploit the idiosyncrasy of Release 2 would not be tripped up by the update.

PUTTING TEXT VALUES TO WORK

I have a tip so basic you must have mentioned it, but perhaps it bears repeating.

When totaling a column or row with the @SUM function, you often insert new values at the beginning or end of the range. However, it's easy to forget that the spreadsheet does not automatically adjust the function's specified range so that it includes the new values. To sidestep this limitation, I bracket each end of the summation range with a bar, and I include the bars in the range. For example:

	A	B	C
1	-----		
2		123	
3		456	
4		789	
5	-----		
6	@SUM(A1..A5)		

To include additional numbers in the summation, I use /Worksheet Insert Row to add a row anywhere *between* the horizontal bars, and 1-2-3 automatically expands the @SUM range to encompass the new data.

Carl Flarity
Sunnyvale, California



This golden oldie of spreadsheet tips is worth repeating from time to time. It's always good form to bracket summation columns or rows with blank cells or labels. Virtually all spreadsheet programs accept nonnumeric cells in summation ranges. Each program may handle them differently—for instance, 1-2-3 and Quattro count them as zeros, while SuperCalc and Microsoft Excel ignore them altogether. Yet no matter how they are processed, such cells never disturb the outcome of the formula.

There are good reasons for following this procedure. As Mr. Flarity points out, it's unlikely that you'll add a value beyond the end of the range and expect it to be automatically included in the calculation. Secondly, with some kind of marker, you won't be likely to inadvertently delete one of the end points of the summation range.

In some spreadsheet programs—1-2-3, Release 2.x, among them—deleting the row or column that contains an end-point cell renders the summation formula invalid. This can turn your work to mush, as ERR values pop up all over the sheet.

Some spreadsheets have made progress with the summation procedure. 1-2-3, Release 3, SuperCalc5, and Excel all allow you to delete the row or column containing the end-point cell of a named or referenced range. Rather than invalidating formulas and range names, these programs shrink the reference to reflect the deletion. This accommodation, however, does not remove all the hazards associated with range end points. You can still invalidate a formula or range name in Release 3 or SuperCalc5 by using the Move command to plant a new cell at the end point of a reference. Only Excel is permissive enough to leave you with a valid formula after you replace the end point; however, you may not like the result: it removes the end point from the formula, shrinking the reference.

COMMENTING FORMULAS AND VALUES

Lotus 1-2-3, Release 3 allows the user to add a note to a cell containing a value or for-

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	Position Desired?
	Apart from absent ☐ Yes ☐ No
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	Other special train
How did you learn	

Stafford Kissell & Paulsworth

Dear Jonathan,

"How are you gonna keep'em down on the farm after they've seen Pareé?"

Enclosed is an application for employment with a solid, little company called Cornerstone. They've been looking for a "heavy" with international accounting experience to run the show. The pay and the perks are great. And, of yeah, their office is in Paris...you know, France.

This could be the opportunity you're looking for. It's a young, aggressive group. And, if all works out, I'll have a friend in Paris. *N'est pas?*

Any interest?

Spreadsheets

mula. Simply enter a semicolon after the formula or value; after the semicolon, insert the text up to 512 characters. The comment will be displayed beside the value or formula in the control panel.

Of all the new bells and whistles I've read about in the new release, this is the one I've anticipated most—only to discover it already exists in Release 2.2.

Although undocumented, the process for commenting is much the same in Release 2.2 as it is in Release 3. Decide where you want to place the text, insert a plus sign—instead of a semicolon—then type in your comment in quotation marks. 1-2-3 treats letters as zeros, so the note just adds a zero to the value or formula and has no effect.

This method even has one advantage over Release 3's. The comment can go either before or after the formula. In Release 3 it has to follow the formula.

R. A. McCormack
Thunder Bay, Ontario
Canada



The advantage to Mr. McCormack's technique is more extensive than he even realizes. You can use this method to document each expression within a formula—not just the formula as a whole.

For example, you can write the following

```
6500+*(January)*+7000+*(February)*+
0500+*(March)*
```

and Release 2.2 will return 21,500.

But the biggest advantage is that it works in both Release 3 and Release 2.2. This makes it particularly handy for Release 3 users who need to exchange .WK1 files with users of Release 2.2. If you save a Release 3 file in .WK1, any comments that follow semicolons are simply thrown away. But comments that are encoded in string formulas will be preserved. There is one limitation to compatibility: Release 3 cells will accept up to 512 characters, but only the first 240 can be saved in a .WK1 file.

Mr. McCormack's commenting method works in *Quattro*, *Quattro Pro*, and *SuperCalc5*, but not in *Excel*. And although it also works with Release 2.2 and Release

3 of 1-2-3, it exemplifies backward-compatibility problems common in spreadsheets: when loaded into Release 2.01, it generates ERR values.

THE COMPATIBILITY ISSUE

As we've discussed so far, all major spreadsheet programs accept text cells within range arguments in statistical functions. But what about other situations where the program expects to process numbers but finds only text?

As it turns out, most spreadsheets have no consistent way of handling this kind of "type mismatch." Lotus, in particular, has shown a great deal of ambivalence on the matter.

Let's take a look at the way the major spreadsheets handle text and numbers mixed in some common formulas. The worksheet

	A	B	C	D
1	DUDE!	100*A1	100/A1	@ABS(A1)
2				
3				

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CIRCLE 235 ON READER SERVICE CARD

Spreadsheets

popular programs:

	100/A1	100/A1	@ABS(A1)
1-2-3 1A	0	ERR	0
1-2-3 2.01	ERR	ERR	ERR
1-2-3 2.2	0	ERR	0
1-2-3 3.0	0	ERR	0
SuperCalc 5	0	ERROR	0
Quattro	0	ERR	0
Quattro Pro	0	ERR	0
Excel	#Value!	#Value!	#Value!

There is not one decent programming language—not even BASIC—that lets you put a numeric expression on one side of an arithmetic operator and a text expression on the other side. But spreadsheets have typically been much more permissive in the area of type mismatches than any other kind of programming tool. Of the programs listed above, none will tolerate a division by text. However, only *Lotus 1-2-3*, Release 2.01, and *Excel* object to text in other numeric contexts. In situations which do not involve division, all of the

other programs evaluate such text as 0.

Lotus evidently considered the rejection of type mismatches in Release 2.01 to be out of step with the "spirit of spreadsheeting" and revised its policy in both Release 2.2 and Release 3. Unfortunately, in doing so Lotus may have created some compatibility problems for shops that use both Release 2.01 and either of the two newest versions.

THE STATIC-DATE MACRO REVISITED

Many readers wrote in that there are simpler methods of converting a date formula to a date constant than the macro we sug-

gested in the September 12, 1989, issue. There are, and here is one of them.

The method we originally presented converted the @NOW formula to an @DATE formula that yielded the current date. However, if all you really need to do is "fix" the outcome of an @NOW or @TODAY formula so that it remains the same from day to day, the simplest approach (in 1-2-3) is to highlight the cell, press F2, then press F9, and finally press Enter. This procedure calculates the formula on the edit line and enters the calculated result into the cell. Other programs have comparably simple procedures for converting a single formula to a constant.

Spreadsheets have
been more permissive
in type mismatches
than any other kind of
programming tool.

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Philadelphia Inquirer

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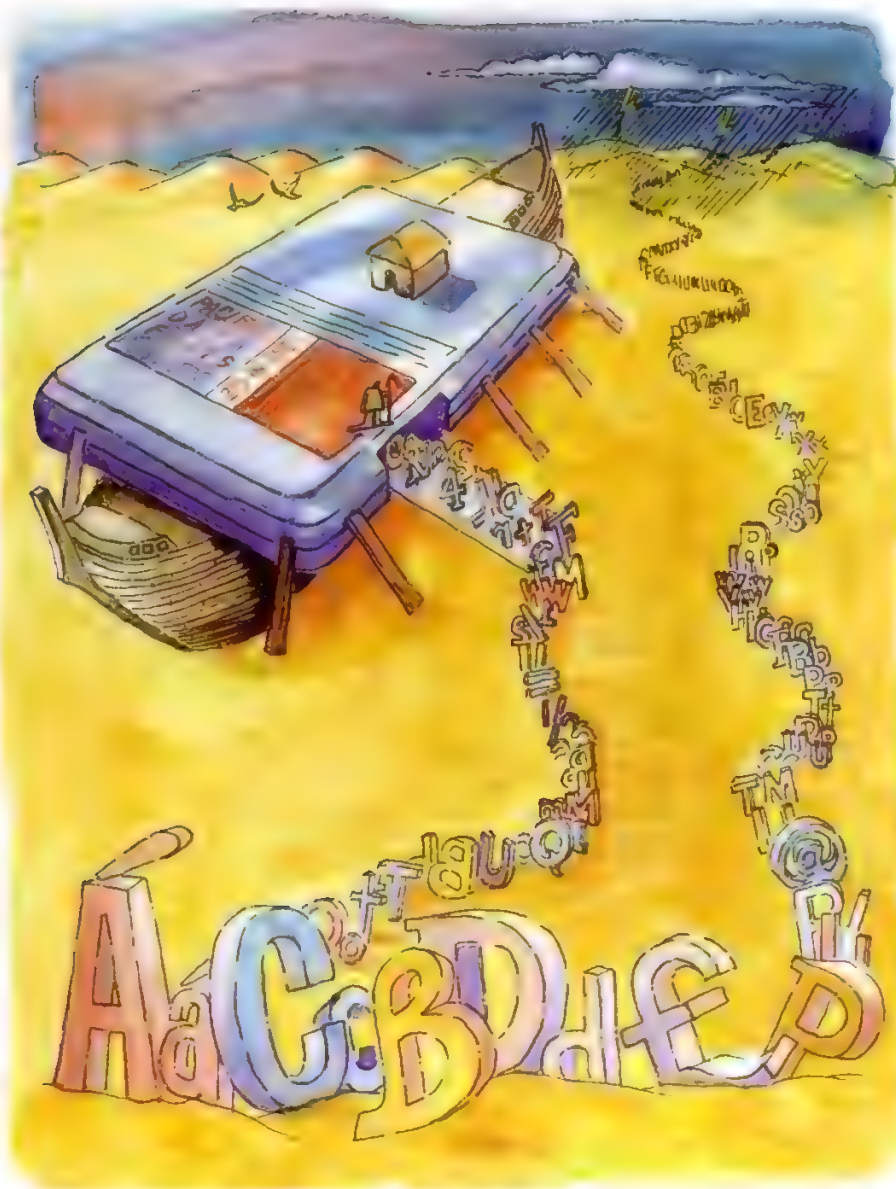
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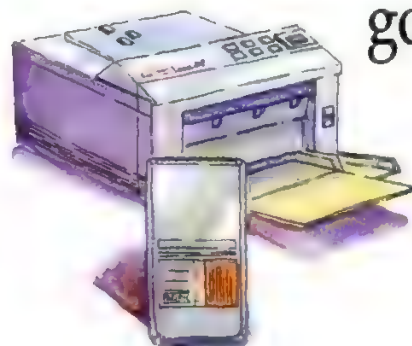
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edited by
Tony Rizzo

Languages

FLUSHING FILE BUFFERS IN QUICKBASIC

Database applications in QuickBASIC 4.5 are fast and relatively easy to write, but there's one potential problem: to force random or binary file buffers to be written to disk, you must close and then reopen each file. If the buffers are not flushed after each write and the application is then improperly exited (owing to power failure or disk removal), the data files will not be updated correctly on-disk. Unfortunately, closing and reopening the file after each record is written takes a fair amount of time.

There is an easy fix for this problem. It does not involve assembly code or complicated subprogram calls—simply use the SHELL command. Using SHELL with an empty argument (such as " ") will cause QuickBASIC to flush all open random and binary (but not sequential) file buffers.

This solution will fail if the application has the maximum number of files open (15) when SHELL is used. It will also fail if COMMAND.COM is not available on the boot device, or if there's insufficient memory. Otherwise, it works like a charm, and it's much faster than closing and reopening all files, especially if those files are fielded.

The example in Figure 1 illustrates my solution. If you remove the floppy disk from drive A: when the program prints the message, it will contain a zero-length file called FOO.DAT. Even though the drive will make sounds indicating the data was written, the directory entry for that file will not have been updated. Please note that this program must be compiled to an .EXE file to avoid intervention by the QuickBASIC editor.

Bruce W. Tonkin
Round Lake, Illinois



This is a clever solution to what has always been a sticky problem. The only other methods I have seen require either assembly language or the use of CALL INTERRUPT to create and then close a "duplicate handle." Either of these methods for flushing buffers requires considerably more effort than Mr.

- **FLUSHING FILE BUFFERS IN QUICKBASIC:** Use the QuickBASIC SHELL command to flush file buffers quickly.
- **DISTINGUISHING ASCII AND SCAN CODES:** It's easy to confuse scan codes with ASCII codes; here are several ways around the problem.
- **PASSING COMMANDS FROM QUICKBASIC:** Stuff the PC's keyboard buffer from QuickBASIC in order to pass commands to DOS.
- **WHICH CODE IS FASTER?** It's not always obvious which control structure to use in a given situation.

Tonkin's simple approach.

While we're on the subject of SHELL, it is useful to point out that QuickBASIC attempts to make as much memory available as possible before it invokes a secondary copy of COMMAND.COM. Therefore, if you use SHELL to run other

programs or batch files, you should first erase any unused dynamic arrays. This will afford the maximum amount of memory for programs that are subsequently run.—*Ethan Winer*

DISTINGUISHING ASCII AND SCAN CODES

When you're processing keystrokes from the menu of a C program, the overlap of extended and ASCII codes can be confusing and annoying. Assume you want to work with keyboard input until the END key is pressed. The C getch() function returns 79 for both the END key and the capital O. My inkey() function adds a value to any extended code, providing an easy-to-use discriminator.

David Graham
San Angelo, Texas



You are absolutely right. Both Turbo C and QuickC have getch() functions that return a 0 when a non-ASCII key (like END) is pressed. To get the scan code, you have to call getch() again, which results in code like

```
int c;  
.  
.  
.  
if (1(c = getch()))  
    c = getch();
```

Unfortunately, this does not help solve the other problem: many scan codes and AS-

BUFFER FLUSHING DEMO

COMPLETE LISTING

```
OPEN "R", 1, "a:foo.dat", 100 'a floppy drive shows the problem best  
FIELD #1, 100 AS a$  
FOR i = 1 TO 100  
    LSET a$ = STRING$(100, 65 + i) '100 records of nonsense  
    PUT 1, i 'write them out  
NEXT i  
  
LINE INPUT "Remove the disk"; b$ 'remove disk and "DIR" it on another PC  
SHELL " " 'now replace it in this PC and press Enter
```

Figure 1: The simple program shown here demonstrates how to use the SHELL command to flush all open random and binary file buffers.

Languages

CII values are the same.

I kept your basic solution intact but wrote a modified version of the function for Turbo C that takes advantage of its pseudoregisters and in-line assembler, resulting in smaller, faster code. (However, to compile it for Turbo C, you'll have to use the TCC command-line compiler.) Since separate versions of the function are provided for both Turbo C and Microsoft C (or QuickC), I've included compilation controls. To enable the appropriate compilation, include a defined macro, either MSC or TC, at the beginning of the source file. Figure 2 shows the listing for KEYTEST.C and the inkey function.

I used 256 as the value that distinguishes ASCII and scan codes. First, it's easy to toggle on and off the bit that represents this value. And, most programmers use an int when dealing with getch(), leaving several bits unused and available. In order to take advantage of the bit that represents 256, I added a few macros that detect the state of the bit or turn it on and off.

—Richard Hale Shaw

PASSING COMMANDS FROM QUICKBASIC

Although the QuickBASIC RUN statement allows one program to run another, the second program must be in an .EXE format. This precludes running .COM programs or .BAT files, severely restricting its usefulness. One possible workaround is to use SHELL, which can execute any legal DOS command. Unfortunately, SHELL retains the original program in memory, leaving that much less available for the program being run. A much better solution is to insert the name of the program directly into the PC's keyboard buffer. This way, when the current program ends, the characters will already be entered, as if they had been typed by the user.

My subprogram PassCommand, shown in Figure 3, accepts a string argument containing the program name or DOS command to be executed. It first makes room in the keyboard buffer by setting the head and tail pointers and then uses POKE to insert the characters. Figure 3 also lists a brief demonstration routine that first calls PassCommand with the string CHKDSK and then immediately ends to run the program.

Geoffrey A. Levand
Urbana, Illinois

KEYTEST.C

COMPLETE LISTING



```
/* keytest.c */
#define MSC

#include<conio.h>
#include<stdio.h>

#if defined(TRUE)
#define TRUE 1
#endif

#define SCANCODE(value) (value | 0x100)
#define ISSCAN(value) (value & 0x100)
#define NOSCAN(value) (value & ~0x100)

#define CTL(value) (value-'A'+1)
#define HOME SCANCODE(71)
#define END SCANCODE(79)
#define PGUP SCANCODE(73)
#define PGDN SCANCODE(81)

void main(void);
int inkey(void);

void main(void)
{
    int c;

    while(TRUE)
    {
        c = inkey();
        if(ISCAN(c))
            printf("%d received for scan code %d\n",c,NOSCAN(c));
        else
            printf("%c = %d\n",c,c);
        if(c == CTL('C'))
            break;
        switch(c)
        {
            case HOME:
                printf("HOME pressed\n");
                break;
            case END:
                printf("END pressed\n");
                break;
            case PGUP:
                printf("PGUP pressed\n");
                break;
            case PGDN:
                printf("PGDN pressed\n");
                break;
        }
    }
}

int inkey(void)
{
    #if defined(TC)
        _AH = 0;
        asm int 16h
        if(!_AL)
            return SCANCODE(_AH);
        return _AL;
    #endif

    #if defined(MSC)
        #include<dos.h>

        union REGS r;

        r.h.ah = 0;
        int86(0x16,&r,&r);
        if(r.h.al)
            return SCANCODE(r.h.ah);
        return r.h.al;
    #endif
}
```

Figure 2: The program KEYTEST.C exercises the inkey() function. The inkey() function makes it easy to distinguish between ASCII and scan codes. Separate versions of the function are provided for both Turbo C and Microsoft C (or QuickC).

Languages

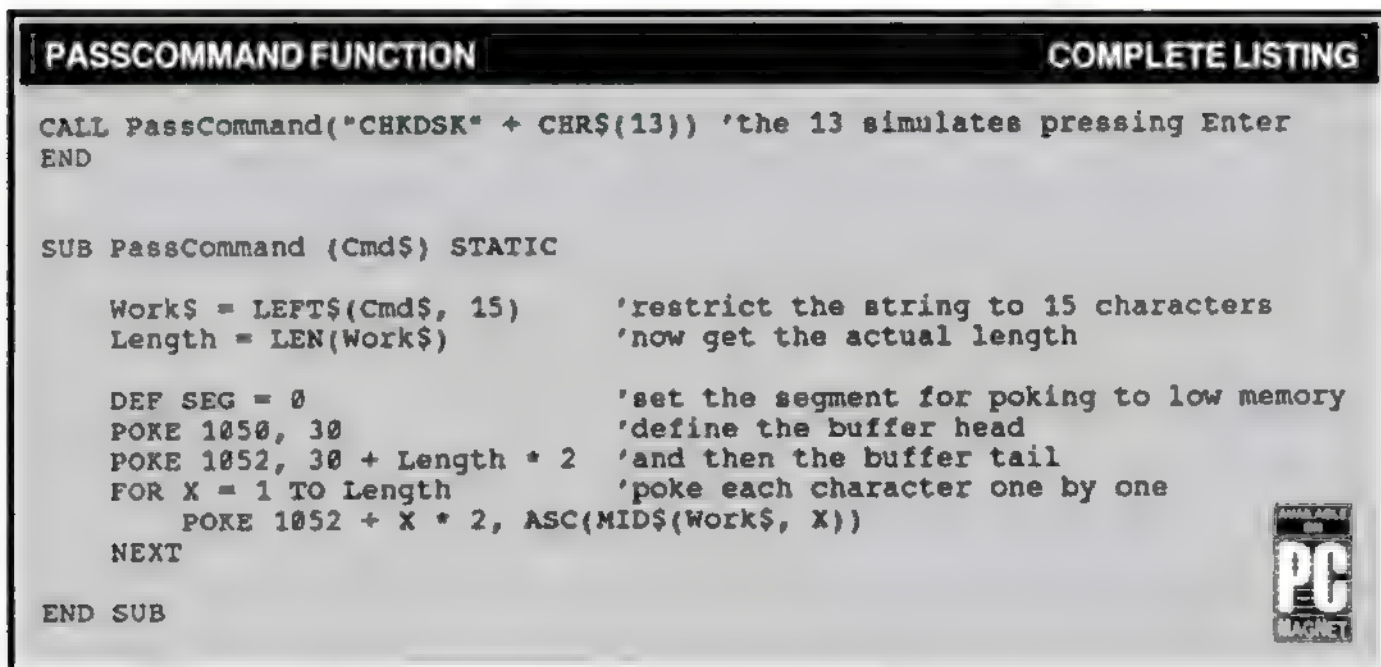


Figure 3: Source listing for PassCommand, which puts characters into the keyboard buffer in order to pass commands from QuickBASIC to DOS, and a brief routine that uses PassCommand.



I reworked Mr. Levand's original submission slightly to eliminate some unnecessary steps. Since the keyboard buffer can accept only 15 characters or fewer, a batch file must be created to accommodate commands longer than that. However, this technique is ideal for writing DOS menu programs in BASIC, because any number of commands can be specified. For example, the program could open a batch file for output, writing the commands needed to change drives or directories, and then run the selected program. Additional lines would then change back to the current directory and rerun the menu program again. This technique is also ideal for passing keystrokes around within a program. For example, it could be used to enter a default response for the INPUT statement.—*Ethan Winer*

WHICH CODE IS FASTER?

Modern BASIC compilers such as Microsoft QuickBASIC provide a wealth of new and important features. These include structured IF/ELSE/END IF blocks, as well as WHILE/WEND, DO/LOOP, and SELECT CASE. However, in situations where either construct could be used, it is not always apparent which would be the most suitable. Which is smaller, and which provides the smallest final code size?

Don Resnick

Old Greenwich, Connecticut



As you've discovered, there are often several ways to achieve similar goals in QuickBASIC, and it is indeed not always obvious which control structure makes the most sense in a given

situation. As it turns out, it rarely matters which of these conditional or decision-making forms is used, because they are all compiled to nearly identical code. The only real exception is that SELECT CASE is slightly more efficient than IF and ELSEIF when the tests are performed on an identical expression.

In the first example below, the expression being tested ($X + Y$) must be evaluated repeatedly, once for each instance of the ELSEIF statement. In the second example the expression is evaluated only once and the result is saved internally in a temporary variable which is then used for subsequent comparisons.

```
'evaluate X + Y, compare to 10
IF X + Y > 10 THEN
    .
'evaluate again, then compare to 5
ELSEIF X + Y > 5 THEN
    .
'evaluate yet again, compare to 2
ELSEIF X + Y > 2 THEN
    .
END IF

'evaluate X + Y, save internally
SELECT CASE X + Y
'compare temporary variable to 10
CASE > 10
    .
'compare temporary variable to 5
CASE > 5
    .
'compare temporary variable to 2
CASE > 2
    .
END SELECT
```

From the perspective of the 8088, a separate compare and jump operation must be performed for each of the possible cases. That is, when you use the expression $IF X + Y > 10$, the actual code that QuickBASIC would generate is more like the following:

```
'evaluate X + Y and save the
result
Temp = X + Y

'if comparison NOT true skip ahead
IF Temp <= 10 THEN GOTO Ahead1
    . 'otherwise execute
    . 'the code specified
Ahead1:
```

I'm frequently amused by programmers who argue so vehemently against all use of the GOTO statement, because that is the

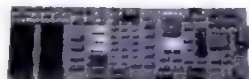
**I'm amused by
programmers who
argue against all use of
the GOTO statement,
because that's the only
programming "style" a
CPU can actually
understand.**

only programming "style" a CPU can actually understand. There are no fancy programming constructs in assembly language, which is, of course, what compiled code is ultimately reduced to.—*Ethan Winer*

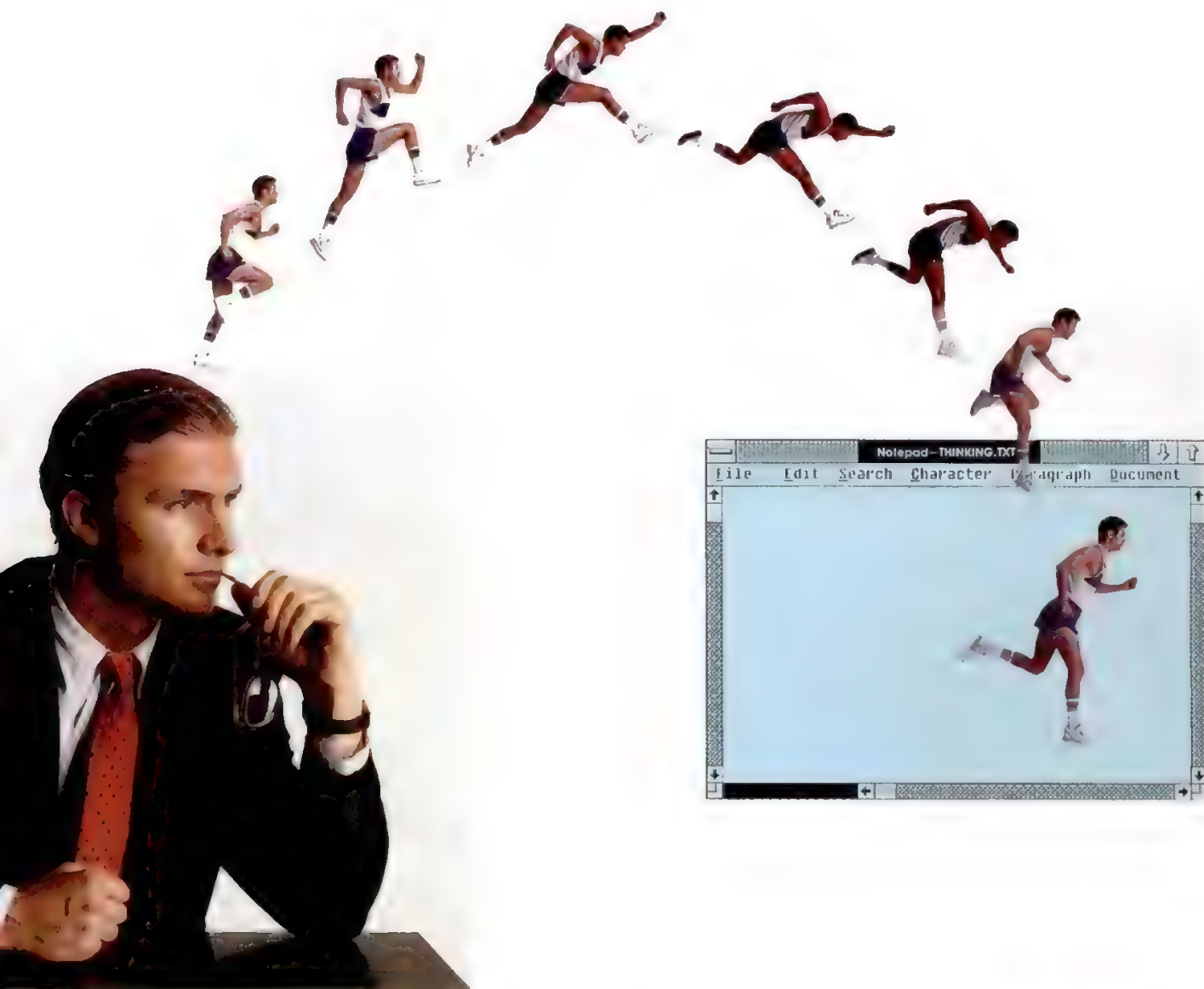
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CIRCLE 258 ON READER SERVICE CARD

NEC

by
Jeff Proise

Tutor

LOST CLUSTER CHAOS

What does it mean when CHKDSK returns with the message

```
10 lost clusters found in 2 chains
Convert lost chains to files
(Y/N)?
```

What exactly are "lost chains"? Should I let CHKDSK convert them to files? And what do I do with the files once I have them?

Margaret Miller
Redwood City, California



When CHKDSK analyzes a disk, it searches the file allocation table (FAT) for clusters that are marked as if they were used but that don't belong to a file. Chains that aren't referenced in a directory entry (and thus aren't part of a file) are identified as lost chains. The error message you describe simply means that CHKDSK has found two otherwise valid chains of FAT entries that aren't referenced elsewhere. Chances are the orphaned clusters once belonged to a file, but that something—a wayward program, perhaps, or an accidental loss of power while DOS was updating your disk—corrupted the FAT and left them stranded.

Figure 1 shows a typical chain of FAT entries for a file that requires, in this example, ten clusters of storage space. The file is fragmented into two physical locations on the disk. The first half spans clusters 40h through 45h, and the second half spans clusters 8Ah through 8Dh. The starting cluster number is stored in the word at offset 1Ah in the file's directory entry, and each FAT entry holds the number of the next cluster in the chain.

The final cluster is marked with the value FFFh if the FAT uses 12-bit entries (FAT entries are 12 bits in length on disks formatted with DOS 2.x and on volumes smaller than 16MB in size formatted with DOS 3.x) or FFFFh if the FAT uses 16-bit entries (used exclusively on disks formatted with DOS 3.x). Together, the individual elements form a chain that allows DOS

■ **LOST CLUSTER CHAOS:**
Dealing with CHKDSK's fearsome "lost cluster" file-error conditions.

■ **A FIX FOR LASERLST:**
A small change in the code lets LASERLST work with all members of the LaserJet family.

to trace through the file from beginning to end. DOS assigns particular meanings to values that appear in the FAT; Figure 2 lists these values.

If the directory entry for the chain in Figure 1 were destroyed and the FAT entries were left intact, the chain would be lost. However, lost chains frequently contain data you want to recover. To help you salvage them, CHKDSK offers to convert lost chains to files by creating new entries for them in the root directory. Each lost chain results in one new file. The first is named FILE0000.CHK. If there are more, CHKDSK numbers them sequentially with the filenames FILE0001.CHK, FILE0002.CHK, and so on.

Once a lost chain is converted to a file so that you can use conventional DOS file system commands, you have several alternatives. The first order of business is to find out where it came from. If it was once part of a text file, simply typing it to the screen may provide a clue to its identity. If it came from a spreadsheet or a binary executable file, its origins may not be so obvious. It's your job to use the .CHK files to reconstruct the files that were corrupted in the FAT. But even if the .CHK files themselves turn out to be useless, CHKDSK's efforts weren't wasted: in the course of converting the lost chains to files, it repaired the damaged FAT.

Often a single error in the FAT will cause CHKDSK to report not just one error, but many. The diagram labeled

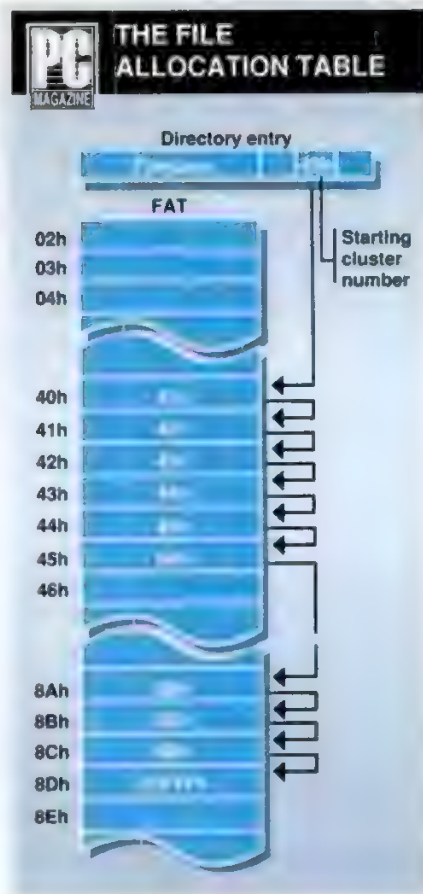


Figure 1: DOS keeps track of where files are stored by mapping them in the disk's file allocation table, or FAT. A file's starting cluster number is stored in the word at offset 1Ah in its directory entry, and each FAT entry holds the number of the next cluster in the chain. The last cluster in the chain is marked with the value FFFh in 12-bit FATs, FFFFh in 16-bit FATs.

"Damaged FAT" in Figure 3 shows what the chain in Figure 1 would look like if the sixth FAT entry were inadvertently overwritten with a 0. If CHKDSK were run in fix mode, it would first report that it had found an invalid cluster (the one marked with the 0), then truncate the file by replacing the 0 with an end-of-chain marker. Then it would go on to report having found four lost clusters in one chain—actually

Tutor

the portion of the file that was truncated. It can't do much else, because once a FAT entry is destroyed, the chain is broken, and

CHKDSK has no way of knowing where to go to find the next entry in the chain.

The diagram in Figure 3 labeled "Repaired FAT" shows how the FAT would appear after CHKDSK had repaired it. The invalid cluster entry is gone, replaced with an end-of-chain identifier, and the part of

the chain that was isolated is referenced in the newly created directory entry FILE0000.CHK. The starting cluster field in the directory entry is set to 8Ah—the first cluster of the new chain.

CHKDSK checks for other inconsistencies in the FAT as well, including cross-linked clusters (clusters that are referenced in more than one chain), unreadable sectors in the file allocation table, invalid sub-directory entries, and file length designators that don't agree with cluster counts, to name a few. If you run CHKDSK without the /F switch, none of the changes will be written to disk, even if you answer yes when it asks if you want changes made. It's good practice to run CHKDSK regularly to avert potential disaster posed by problems in the FAT.



FILE ALLOCATION TABLE ENTRIES

Value	Meaning
(0)000h	Unused cluster
(F)FF0-(F)FF6h	Reserved cluster
(F)FF7h	Bad cluster
(F)FF8-(F)FFFh	Last cluster in chain
All others	Number of next cluster in chain

Figure 2: DOS assigns specific meanings to values that appear in file allocation tables. Digits shown in parentheses are used in 16-bit FATs but omitted in 12-bit FATs. Although values that fall within the range (F)FF0-(F)FFFh are all defined, you'll rarely see anything but (F)FF7h and (F)FFFh used.



CONVERTING LOST CHAINS TO FILES

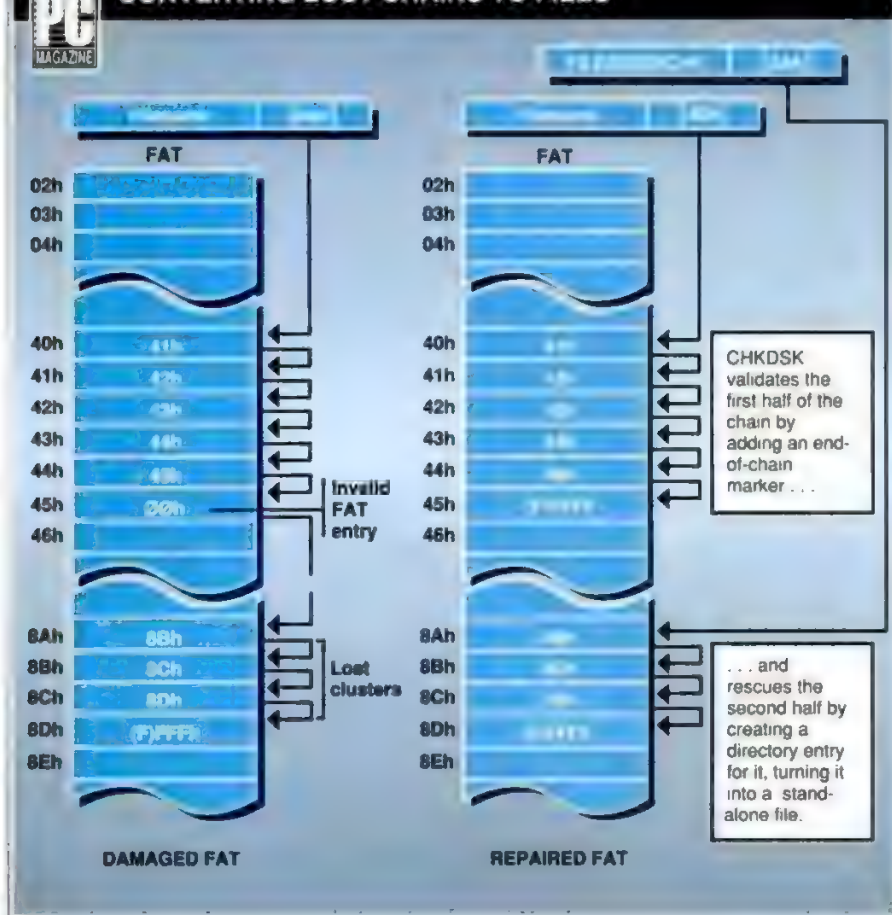


Figure 3: Otherwise valid chains that aren't referenced in a directory entry (and thus aren't part of a file) are known as lost chains. CHKDSK converts a lost chain to a file by creating an entry for it in the root directory and filling in the starting cluster field with the number of the first cluster in the chain.

A FIX FOR LASERLST

I love Bob Flanders and Michael Holmes's LASERLST program published in your April 11, 1989, Utilities column, but I'm having problems using it with a LaserJet IIP. Rather than getting one printed page for every two pages in the text file, I'm getting four: one with the first page of text, one with the vertical bar that divides the page, one with the second page, and one that's blank. Why is this? I thought the IIP was supposed to be compatible with the LaserJet II.

Mike Cole
Lenoir City, Tennessee



It is. But there's a subtle difference in the way the LaserJet II and IIP handle perforation skips. That difference, combined with a small error in the way LASERLST initializes the printer, is causing the IIP to eject four pages when it should be ejecting one.

LASERLST traverses the page from top to bottom three times in the course of filling it in with text: once to print the left half of the page, once to print the vertical bar, and a third time to print the right half of the page. Each time LASERLST issues a line feed after printing on the last line of the page, the logical cursor moves into the perforation skip region and the IIP automatically ejects the page. The reason the LaserJet II doesn't do the same is that it handles movement of the logical cursor into the bottom margin a little differently: it doesn't eject the page unless you try to print a character there.

But wait: doesn't LASERLST set the text length to 71 lines and print only 68 lines to keep the cursor out of the perforation skip region? Yes. Or at least that's

Tutor

what it was intended to do. But if you look closely at the source code, you'll find that it issues the escape sequence <ESC>&171F to set the text length to 71 lines prior to sending the string <ESC>&16E to set the top margin to 6. The problem is that the LaserJet recalculates the text length when the top margin is reset, so the previous call to set the text length is void-

**It's good practice
to run CHKDSK
regularly to avert
potential disaster.**

ed. With the VMI (vertical motion index) set to 5.14/48 inches on a landscape 8.5-by 11-inch page, the new text length is 68.7 lines—just enough to cause the program to violate the perf skip zone when a line feed is issued on the 68th line.

The fix is an easy one. Just use the following DEBUG script to patch LASERLST so that the order of the two escape sequences is reversed:

```
DEBUG LASERLST.COM
E 0282 1B,"&16E"
E 0287 1B,"&171F"
W
Q
```

With this change, LASERLST will work equally well on any member of the LaserJet family—including the IID, which handles perf skips just like the IIP.

ASK THE TUTOR

The Tutor solves practical problems and explains points of general interest about using your hardware and software more productively and answers basic questions about DOS and systems in general. To have your questions answered here, write to Tutor, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload them to PC MagNet (see the "By Modem" sidebar in the Utilities column). We're sorry, but we cannot answer questions personally. ■

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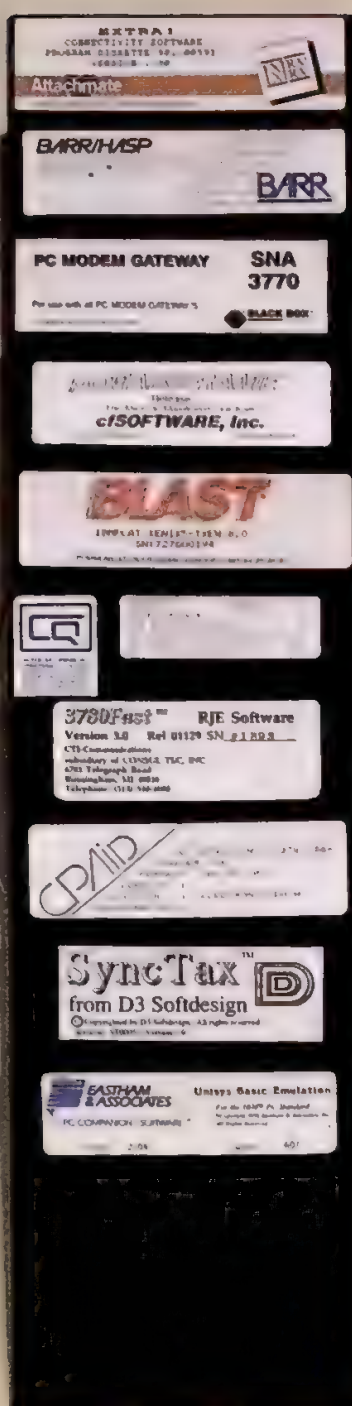
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Frank J. Derfler, Jr.

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SHARING TELEPHONE LINES

Is there a good way to share a single incoming telephone line between a fax machine and a modem? We want to hold down costs, but we're running out of telephone wires!

Ron Glass
Riverside, Illinois



Millions of us woke up one morning in 1989 and found that we couldn't do business without a fax machine. Today people fax orders, confirmations, proposals, lunch menus, and images of their hands and noses across town and across the country millions of times a day. If you work in an organization with a PBX telephone system, adding one or more lines isn't a big deal. You just run another line from the PBX to the desktop and let the PBX economically share outside lines among contending callers. But if you have to order a separate business telephone line for every fax machine and modem in your organization, your telephone costs begin to skyrocket.

There is a new class of equipment called *telephone line controllers* that can, with the cooperation of some callers, detect the nature of the incoming call and share one telephone line among a fax, a modem, an answering machine, and a regular telephone.

These small devices typically cost around \$200 and resemble a modem with extra RJ-11 jacks and no RS-232C connector. The principle behind these controllers is that voice calls are silent while fax machines and modems either send or can be made to send tones when they call. If the telephone line controller detects a fax or modem tone, it connects the appropriate machine. If no tone is detected, the controller decides that the incoming call is for voice and rings the attached phone or answering machine.

This description raises two questions: How does the line controller avoid presenting voice callers with a long period of silence while trying to decide how to an-

■ **SHARING TELEPHONE LINES:** Telephone line controllers allow faxes, modems, and phones to share a single line.

■ **NETWORK PRINTING FROM A DATABASE:** Here's how to send print jobs without leaving your application.

■ **HANDLING FILES ON MULTIPLE SERVERS:** The right software makes it easy to keep track of your files.

swer, and how does it know a modem is calling when calling modems don't normally send tones?

Telephone line controllers fool voice callers into patience by sending the sound of a telephone ring down the line even after they have answered the phone. Between rings, these devices listen for the 1,100-Hz tone automatically generated by a calling fax machine or for a tone sent out by a modem.

Since calling modems don't normally make noise until they hear the tone of an answering modem, the modem-user making the call must take some special action to elicit the necessary tone. Different line-controller products handle this in different ways. Some products ask the caller to send a late dialing digit down the phone line. You can program modems that respond to the AT command set to do this by adding a string of commas after the phone number and then the digit. For example, the dialing command ATDT18005551212,,,4 causes the modem to dial the number, wait, and then send the dialing tones for the number 4 down the line. The line controller listens for the dialed digit and rings the answer modem to bring it on-line.

Other controllers require that the caller use the "reverse" option in the AT command set. Adding an R to the dialing string causes the modem to reverse and send the answer tones. The line controller quickly detects these tones and rings its modem. Commands sent to the modem attached to the controller cause it to respond with the call tones.

Knowing about telephone line controllers can make you a hero with your boss and accountant—these little devices often pay for themselves within a few months. One product we can recommend from experience is the Fax Line Manager, marketed by Technology Concepts at (415) 349-0900.

NETWORK PRINTING FROM A DATABASE

When you send a print job to a networked printer under IBM's PC LAN software, the job stays in the print queue until the print server recognizes that the print stream has ended. This occurs after a period of time, after you quit the program, or if you send it a Shift-PrtSc, but none of these choices make our users happy. They want to see their print jobs right away without having to quit a FoxBASE or dBASE application.

I wrote a DOS program to truncate the print stream. We invoked the program using the FoxBASE/dBASE !/RUN command. This worked fine until we installed DOS 4.01 and PC LAN, Version 1.3. Both of these programs require so much more memory than their predecessors that we were no longer able to invoke DOS from within FoxBASE.

Our solution was to create a program that conforms to the FoxBASE/dBASE binary file specifications and uses DOS interrupt 2Ah function 06h to truncate the print job. You run this program directly from FoxBASE or dBASE.

Load the .BIN file at the beginning of your application using a LOAD.TPS command. Then any time you print a job in your application, issue the command CALL TPS and the print job will queue to the printer.

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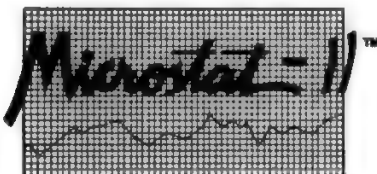
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N TPRT.BIN		PC MAGNET
A		
MOV	AB,06	
MOV	AL,03	
INT	2A	
RETF		
RCX		
7		
W		
Q		

Figure 1: Use the program this DEBUG script creates to print without quitting your application.

TPS has no effect if you CALL it and your current default printer is not redirected.

Rick D. Early
Silver Spring, Maryland



If you want to know more about how this program works, the IBM PC LAN manual describes the network print-stream control in Appendix C. To create TPS.BIN, copy the text from Figure 1 using any word processor that can create a plain ASCII text file. Be sure to include the blank line after the RETF statement and after the final Q. Save the file as TPS.SCR. Now pass this file as input to DEBUG:

```
DEBUG < TPS.SCR
```

If you see Error anywhere in the display, do not attempt to run the resulting program. Instead, double-check your script to see what went wrong and correct it; then run the script through DEBUG again.

HANDLING FILES ON MULTIPLE SERVERS

As our Novell network grew, we added additional servers. The response time of the network is excellent, and we have few administrative problems, but moving files between the servers and between subdirectories is a hassle. Can you recommend some software for network file management?

Reggy Pauling
New York, New York



The LAN Labs crew has about 3 gigabytes of files on four servers. Programs, benchmark test results, and hundreds of megabytes of text occupy countless pockets of storage. We couldn't keep it straight without *Navigate*, from Performance Technology.

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If your office generates a lot of text, you'll also like another program we find useful: *Vq* from Golden Bow Systems.

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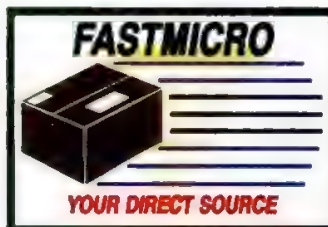
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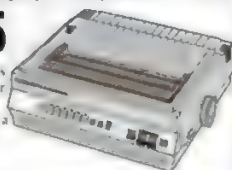
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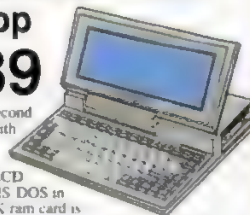
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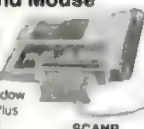
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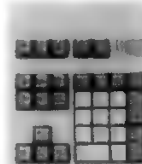
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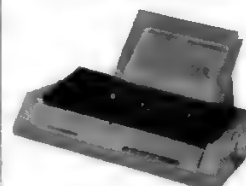
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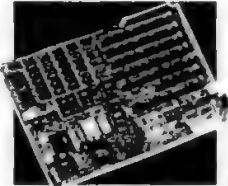
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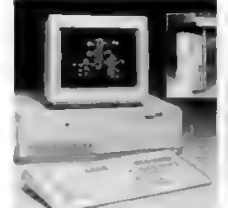
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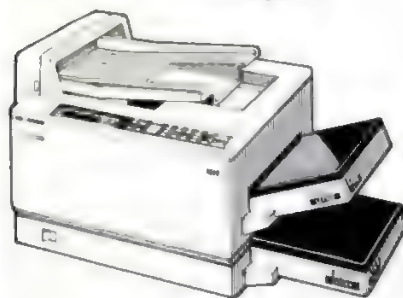
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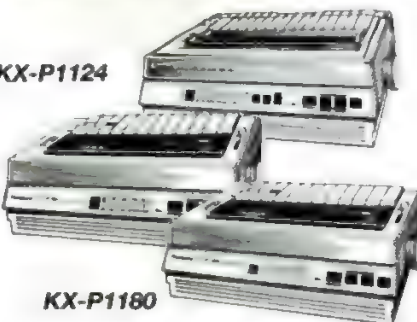
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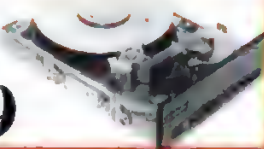
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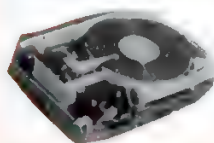
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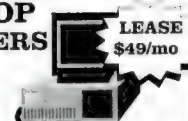
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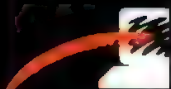
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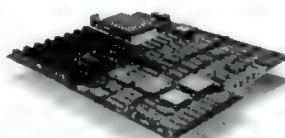
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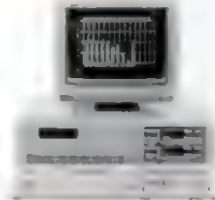
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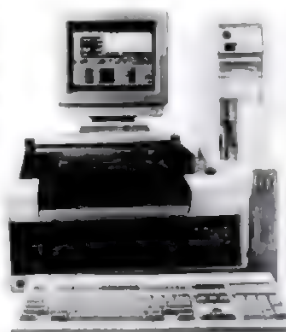
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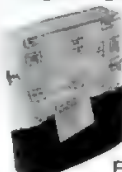
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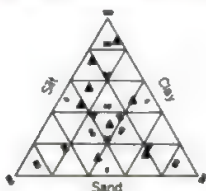
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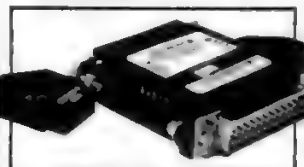
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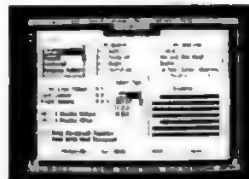
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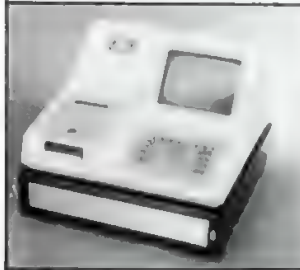


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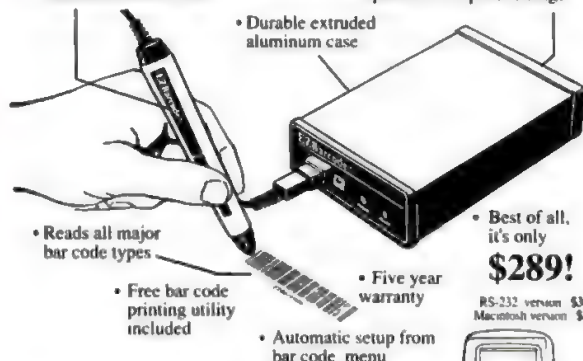
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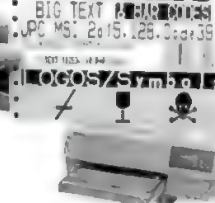
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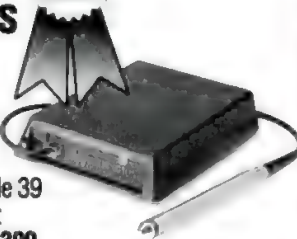


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After Hours

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Tax Preparation Software Moves Toward Electronic Filing, Artificial Intelligence

PERSONAL FINANCE
by Laura Lou Meadows

Death and taxes may be the only true constants, but *PC Magazine's* yearly review of tax preparation software is almost as inevitable an event. The 1989 installment looks at seven programs intended to help individuals prepare their returns with as little pain and suffering as possible.

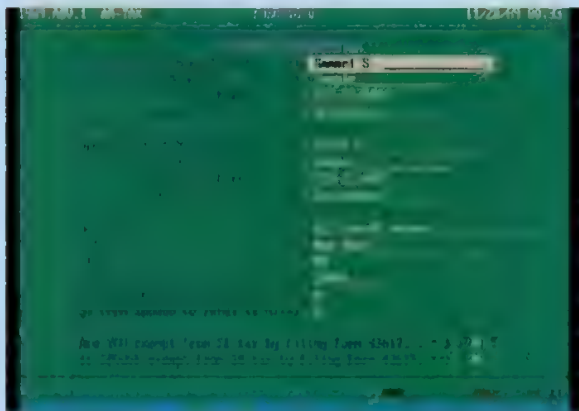
In this first of two installments, we examine four packages, including two that have emerged as standouts in the category. Just as evolution has taken its toll

on the *VisiCalc*s and the *WordStars*, software Darwinism works on the annual updates of tax-return programs too. Some have added features and maximized ease of use, while others have been slower to evolve and improve. In this age of artificial intelligence, electronic filing, and advanced interface design, software that doesn't keep up gets outdated very quickly.

AM-Tax

AM Software's *AM-Tax* began life as a shareware program. Since then, it has been enhanced with additional forms, expanded printing capabilities, and an improved manual that includes separate notes

about each supported tax form. The *AM-Tax Advanced* version now supports a total of 39 tax forms and worksheets. It prints an IRS-approved Form 1040 replica on a dot matrix printer or on a laser printer equipped with a tax font cartridge.



AM-Tax's personal information screen, like the rest of the program, is basic and functional.

After you set your system options, you are ready to begin preparing a return with *AM-Tax*. The package prompts you for necessary information and leads you through the questions on the federal Form 1040. When you come to a line that requires a supporting schedule (such as line 8, if you earned more than \$400 in interest income), a tap of the F6 key takes you to the required schedule, which in this case would be Schedule B for interest and dividends. After you make the necessary calculations, the F10 key brings you—and the figure you arrived at—back to the Form 1040 screen.

On this basic level, *AM-Tax* does about what other adequate

tax-preparation packages do; in fact, there's no reason why you can't do perfectly well with *AM-Tax* for returns of simple to intermediate complexity. The difference between this software and more-powerful packages, however, becomes evident when you examine its overall range of features, its user interface, and its approach to complex tax issues such as passive activity losses.

Given the improvements in competing packages such as

Andrew Tobias' TaxCut, from MECA Ventures, and ChipSoft's *TurboTax*, *AM-Tax* is now notable for the things it does not do. There is no direct access to a menu of available forms until after you've used them, no on-screen tutorial or context-sensitive help, and no comprehensive interview procedure.

In all fairness, these omissions may be no great loss to you if you are a power user who also happens to have a good tax background. The basic tools are certainly all there, so *AM-Tax Advanced* may be the program that makes you look like a tax-season hero. And if you are plugging along without a hard disk and only 256K of memory, *AM-Tax Regular*, not examined here, may be your tax-time salvation. **List Price:** *AM-Tax Advanced*, \$60.00; *AM-Tax Regular*, \$45.00; state tax modules (available for Calif., Ill., Md., Mo., N.J., N.Y., Ohio, and Va.) \$30 each; upgrade for registered users: *Advanced*, \$39.95, *Regular*, \$29.95, each state

■ *AM-Tax*: basic tools, improved manual.

■ *Andrew Tobias' TaxCut* adds expert-system technology.

■ *J.K. Lasser's Your Income Tax* comes with a copy of the book.

■ *TurboTax*: a classic gets even better.

\$20. Requires: *Advanced*, 320K RAM; *Regular*, 256K RAM; DOS 2.0 or later. AM Software, P.O. Box 25010, Kansas City, MO 64119; (816) 241-0014.

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Andrew Tobias' TaxCut

TaxCut for 1989 is a wonderfully enhanced program that combines the well-regarded writer's knowledgeable approach to financial matters with tax lawyer Dan Caine's technical expertise. Caine, author of last year's fine *Ask Dan About Your Taxes* program (reviewed here in the February 28, 1989, issue), has joined with Tobias to merge their ideas about what the intelligent layman needs to know in order to prepare a tax return.

The MECA manual states, "We swallowed our pride, abandoned our plans to revise an earlier version of our own, and became partners." The result amounts to an artificial-intelligence-inspired dialogue between user and program.

TaxCut is the only software reviewed here that guarantees to pay any penalties imposed by the IRS for errors on your return

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After Hours

TaxCut

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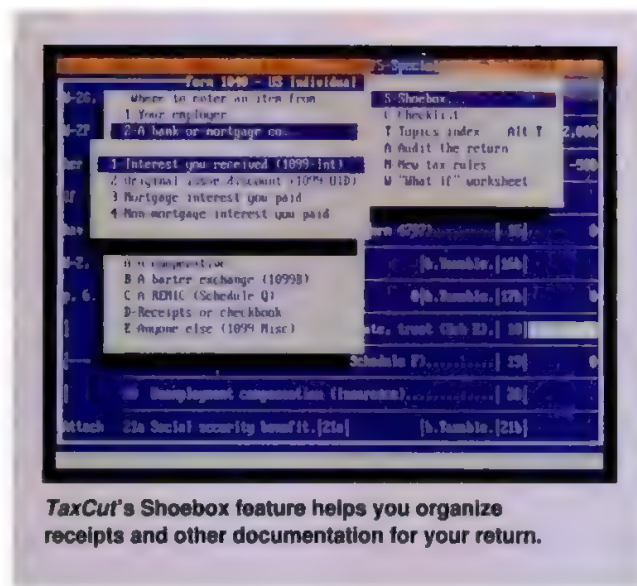
caused by an incorrect calculation. To get the courage for this promise, MECA had the accounting firm of Touche Ross & Co. check the program's number-crunching. That guarantee does come with a few disclaimers, most of which have to do with human decisions about just what to enter and where to enter it.

A good place to start with *TaxCut* is the F1 key, which pulls down a Help menu with an inviting "Hello, New User." In his distinctive and reassuring style, Tobias leads you wittily through a basic tutorial on operations. Next, try the Menu Guide to get a brief overview of the program's features. At this point, you could start filling in the Form 1040 and make it through just fine.

Instead, you may choose the interviewlike Checklist to "talk things over" before getting down to the nitty-gritty of filling in the forms. As you pace through the questions, the program not only orients you to the issues you need to address but also remembers and marks on the Forms List those forms you need to use. *TaxCut* has over 40 forms, schedules, and worksheets. It also puts flags in front of the items in the Topics Index that explain the ground rules that affect your answers.

Once you're ready to go to work, you can bring up the Topics Index, put the cursor on the first item marked, and press Enter. *TaxCut* takes you right to the pertinent form and line and, for about nearly 50 topics where it's available, invokes the Expert Advisor. The Expert walks you through the topic, one element at a time. You can solicit clarification on any highlighted tax term or concept involved and then respond. The Expert collects your answers, figures out the number that applies to you, and puts it on the line of the form or schedule where it's supposed to go.

When additional questions crop up, you can call Form Instruc-



TaxCut's Shoebox feature helps you organize receipts and other documentation for your return.

tions to the screen. This provides background on the topic you selected by translating the gist of the IRS instructions into English. For analytical souls, the Forms Instructions also list the program linkages: numbers that are automatically carried to and from the form on the screen to and from

other parts of the program.

If you're no tax whiz and just want to get on with the job with no detours, you can use *TaxCut's* special features menu to chart a clear route from a year's collection of official notices and smudgy receipts to the finished tax return.

One of the special features, the Shoebox, shows a list of 14 general sources of tax items. From your disorganized pile of tax papers, say you pick up a Form 1099 OID showing taxable original issue discount interest income from the First Faith Savings & Loan. Put the cursor over "a bank or mortgage company," press Enter, and another window lists the kinds of items you're likely to have received. Select the one that says OID and press Enter again.

Now the window says "Report this item on Schedule B Interest & Dividends. Jump to that line now?" Press Enter once more and it takes you to the right line of the right form. Sleek, very sleek.

If during the year you conscientiously store tax information in a program like *Managing Your Money*, *Quicken*, or any spreadsheet or database, you can import that information (words and numbers) into a *TaxCut* Scratch Pad. The Scratch Pad serves as an itemized backup for a total, such as charitable contributions,

FASTER REFUNDS WITH ELECTRONIC FILING: Computerizing Your Relationship with the IRS

by Laura Lou Meadows

This year, the Internal Revenue Service rolls out its electronic filing program nationally. It's all explained there on the first inside page of the Form 1040 package the IRS sent you. Electronic filing means that if you have a tax refund coming, you can arrange to have your federal return filed electronically and receive your refund a lot faster.

When you file electronically, you eliminate your tax return's trip to the post office. Then, if you ask, the IRS will be pleased to do a direct deposit of your refund that zings it directly into your checking or savings account. This eliminates your refund check's trip through the post office. Right there you've saved two trips and anywhere from several days to a couple of weeks.

Then there is the advantage of a 3 percent error rate for

electronically filed returns compared with about 17 percent for all paper returns, including both computer-evaluated and manually evaluated returns. Add to those efficiencies the fact that the tax data from your electronically filed return goes right to the IRS computer and won't need to linger in the IRS in-basket waiting to be rekeyed.

The IRS is promising refunds within two weeks if you file electronically and use direct deposit. This compares with a wait of anywhere from six to eight weeks to receive your refund check if you mail in a paper tax return.

Yes, of course there's a catch. For the 1990 filing season, you can "arrange" to file electronically, but as an individual you can't yet do it all by yourself with your very own modem. The IRS listens only to 4,800- or 9,600-bps modems speaking through software costing sev-

eral hundred dollars.

For the time being, you still need to go through a tax professional accepted for electronic filing by the IRS, who either prepares your return on a computer or copies the numbers from the paper return you prepare into his computer and then transmits it to the IRS. Naturally, the professional preparer or transmitter will charge you a fee for the transmission service, generally ranging from \$10 to \$40.

Somewhere along the way, you'll need to sign a hard copy of Form 8453 U.S. Individual Income Tax Declaration for Electronic Filing and attach the Form W-2. The IRS requires your tax preparer or transmitter to have your signed Declaration and W-2 in hand before it sends your return on its electronic way. They mail in the Declarations and W-2s weekly.

CompuServe has the com-

Laura Lou Meadows is a practicing tax attorney in New York.

After Hours

that goes onto a single line of the return. You can edit the Scratch Pad at will, and the program puts the total on the appropriate line in the tax return.

Print-out time is the moment of truth for tax software. *TaxCut* handles this often-difficult stage with aplomb. From the beginning, the IRS has declined to approve a substitute Form 1040 that didn't have graphic boxes, lines, and typefaces looking very much like the government's original. Now for the first time, *TaxCut* has secured IRS approval for a completely character-based Form 1040 that will print out on virtually any printer: laser, dot matrix, or even daisy wheel.

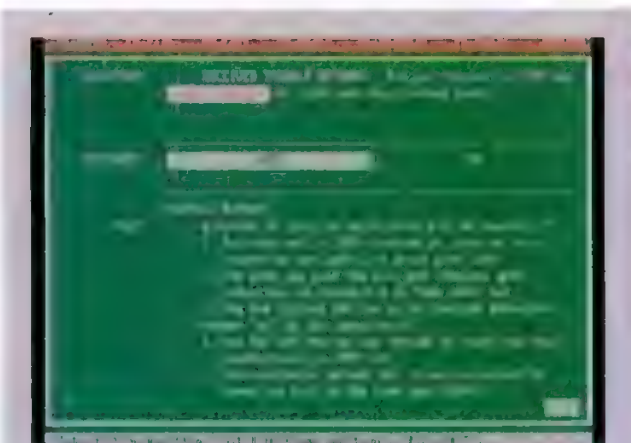
On the other hand, if you have a handy Hewlett-Packard LaserJet II or compatible, *TaxCut* will print all of the graphics necessary to output a spiffy Form 1040 that resembles the official form, without the need for a special tax font. All forms printed by

puter resources to do electronic filing of tax returns but, for now, it is available only through its parent company's H&R Block stores. CompuServe's 550,000 subscribers may be offered the service in future years.

As of this writing in late November 1989, General Electric was deep in negotiations with a California outfit called ELF to make electronic filing available this season to the 170,000 subscribers of GE's on-line service, GENie.

ELF envisions an on-line tax-return-preparation program that you'd access for a charge to your credit card, fill in off-line at your leisure, and then feed back to the on-line program for calculation. Finally, for another charge to your credit card, you would file electronically through the on-line service. Your tax refund would be mailed to you or deposited directly to your bank account.

A number of the programs reviewed here and in the next issue meet the IRS requirements for producing a proper elec-



The Expert Advisor can be called from within *TaxCut* to provide an explanation of terms you highlight.

TaxCut—the 1040 and supporting forms and schedules—are acceptable for filing with the IRS.

Finally, in case you find the siren song of electronic filing irresistible, *TaxCut* has made arrangements for you. Mail a floppy disk with your return data file to Universal Tax Systems in Virginia, along with your W-2s, a signed electronic filing form

(which *TaxCut* prints), and \$19.95, and UTS will file your federal tax return electronically for you.

To test how *TaxCut* performs in the trenches, I ran a moderately complex tax scenario that included a married couple, two salaries, an architect who operates as a sole proprietorship with two depreciable business properties and a partnership interest with passive losses.

As I put the architect's business expenses in Schedule C and reached the line for depreciation, I used the F6 key to take me to the depreciation worksheet and invoked the Expert Adviser. The Expert asked about each asset. When I finished responding, my answers were displayed. The program let me back up and change one or more elements if I had second thoughts about a particular response.

When I finished telling the Expert about the two depreciable properties for the worksheet, *TaxCut* put the numbers on the Form 4652 for depreciation (a backup schedule required by the IRS) and carried it over to the Schedule C, where it also belongs. When I fed the passive losses from the tax shelter partnership into a worksheet, *TaxCut* computed the dreaded passive activities loss limitation form by itself.

Once I finished my entries, I pressed F5 to bring up the Auditor. This screen pointed out any overrides or items I missed and offered pithy advice, such as "consider deducting points for home you bought."

MECA has announced programs for eight state returns, but they were not ready for this review's November deadline.

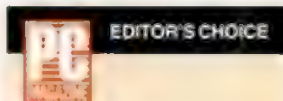
For the computer-literate individual, *TaxCut* offers a sophisticated solution to the April 15 blues. *TaxCut*'s unique Expert Adviser and exceptionally clear and understandable format make an annoying job easier. This is as close as a computer comes to putting a tax expert at your side. It's a great program.

List Price: Andrew Tobias'

TaxCut, \$79.95; state modules (available for Calif., Ill., Mass., N.J., N.Y., Ohio, Pa., and Va.), \$49.95; upgrade for registered users: 40 percent discount for the federal program, \$39.95 for each state module. **Requires:** 512K RAM, DOS 2.0 or later. MECA Ventures Inc., 327 Riverside Ave., Westport, CT 06880; (203) 222-9150.

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CONTINUES



•TurboTax

•Andrew Tobias' *TaxCut* Of the packages reviewed here, *TurboTax* and Andrew Tobias' *TaxCut* offer the best possible tax-preparation tools.

For those who want as much help as possible with their returns, Tobias's software fills the bill admirably. The inclusion of the functionality of *Ask Dan About Your Taxes* gives *TaxCut* a unique and powerful combination of artificial intelligence and sound software design.

TurboTax is recommended to those who want a more streamlined approach; *TurboTax* won't take you by the hand to the degree that *TaxCut* does, but it provides all of the tools for efficient tax-return preparation laid out in intelligent fashion. *TurboTax* is also a good choice for those who operate small-scale seasonal tax preparation practices.

After Hours

CONTINUED

J.K. Lasser's Your Income Tax

For 50 years, *J.K. Lasser's Your Income Tax* has meant reliable tax advice in printed form. The computer program of the same name debuted in promising fashion last year. This year the developers of *Lasser's* adjourned for some behind-the-scenes tinkering with the program's engines, so the finished product was not quite ready to digest my entire test tax scenario in time for this review.

The beta version that I saw was again a respectable program with a patient, plodding approach and features that you're likely to find helpful. What cools my ardor are the all too frequent occasions when *Lasser's* requires two, three, or even four steps to do what *TurboTax* does in one.

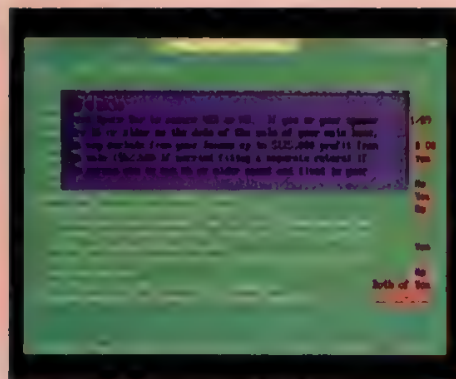
The list of available IRS forms and schedules has grown to 34,

plus a clutch of worksheets. The interview feature pinpoints the forms you may need and flags them on the list of forms. It also has features that are now standard for tax programs, such as a pop-up calculator, a tax summary window, and a 1990 tax planner.

Filling out the forms is easier in *Lasser's* this year now that overrides are possible. When a supporting form or worksheet is available, F7 lights up on the function key menu (at the bot-

tom of the screen) to let you know about it.

The interface feature reads in data from *Quicken* files, though only one item at a time. A touch of F1 opens a window of instruction or advice about the line where the cursor is or about the form generally. Usually, the on-screen instructions include a very convenient paragraph reference to the more comprehensive treatment in the *J.K. Lasser's Your Income Tax* book that is packaged with the program.



J.K. Lasser's Your Income Tax has clear, helpful cross-references to the popular book of the same name, which is included.

I saw the IRS-approved Form 1040 graphic replica that the program prints on a dot matrix printer, but on my laser printer the program produced only the unapproved kind that leaves you hand copying the numbers onto a real 1040. The federal supporting schedules, however, are all submittable. Programs for three states—California, New Jersey, and New York—that read data from the federal program are due out by the time you read this.

J.K. Lasser's Your Income Tax is not a bad program, but it hasn't yet fulfilled last year's promise.

List Price: *J.K. Lasser's Your Income Tax*, \$79.95; state modules (available for Calif., N.J., and N.Y.), \$39.95 each. Upgrades for registered users: 40 percent discount for federal program; state programs, \$29.95. **Requires:** 512K RAM, DOS 2.0 or later. Simon & Schuster Software, 15 Columbus Circle, New York, NY 10023; (800) 624-0023.

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TurboTax

Last season, *TurboTax* was the program my local District Director of Internal Revenue had on his office computer. As the de facto leader in individual tax-return software, ChipSoft's only problem is to be sure nobody overtakes *TurboTax*: it's a classic. In an effort to maintain its lead over last year's hot competition, ChipSoft has added nifty new features and polished up lots of the old ones.

TurboTax employs many conventions familiar from spreadsheet and word processing programs, so finding your way around is about as easy as tax program navigation gets. The program opens with a personal data screen for primary information such as name, social security number, and filing status, that will be used on most tax forms. A touch of the backslash key puts eight pull-down menu titles at the top of the screen.

If you've been confidently sitting down to do your tax returns for years, you can go directly to the Forms Menu, choose the 1040, and start filling it out. You use the F5 key to take you to the right supporting form, schedule, or worksheet whenever the *TurboTax* screen tells you one is needed. The program has 31 official forms and schedules with 13 worksheets.

Or you can take it one step at a time and start with the Personal Interview. In only 52 brief questions, it alerts you to which forms you may need to complete to accommodate your financial history for the year. *TurboTax* places a mark on the Forms Menu in front of the listing for each relevant form.

If computer tax programs are still fairly new to you, you can turn to *TurboTax*'s on-screen tutorial, which is accessed through the How To Use option on the Help menu. If you prefer your help in book form, you can pick up the very thorough, understandable, and well-organized Operations Manual that comes with *TurboTax*.

There is also a Forms Man-

ual that ChipSoft packages with its final January version or mails to registered owners of the early version. This tome contains a complete two-page rundown of each form included in the program. ChipSoft also tucks in a copy of the 364-page *Price Waterhouse Personal Tax Advisor*, 1989-1990 Edition.

If reading up on abstract tax lore is not exactly your idea of stimulating diversion, wait till you get to a juicy conundrum on the Form 1040. Then rub your magic lamp (OK, call for the Help menu) and the IRS instructions for this item pop up in a window now that you are ready to pay attention.

This year *TurboTax* has added a flock of new conveniences and simplified the operation of others. For openers, the package now has mouse support. There is also improved data sharing with financial planning programs or

each asset, complete with the ability to back up and change a response if you need to.

A Data Examiner checks your finished return for errors or omissions. A tax planner plugs in official rates and rules and your personal financial changes for 1990 to give you advance notice of how your tax strategies for next year will work.

The package offers Electronic bulletin board information about where you may find late-breaking news on electronic filing through local ChipSoft consultants. (This service wasn't avail-



One of *TurboTax*'s best new features is a much-improved audit trail of your progress in the depreciation worksheet.



TurboTax has context-sensitive help and windows that display cross-references and linkages to calculations.

spreadsheet ASCII files. The data-sharing facility takes advantage of tax-coded entries to help automate the process of importing numbers into *TurboTax*.

Automatic recalculation, which has been greatly speeded up, was almost instantaneous on my 286 clone. Windows show linkages or cross-references to many calculations. This excellent new feature answers questions like "Where in heaven's name did that number come from?" Or "What did it do with my subtotal?" A warning window shows when data entry is outside the valid range.

A much improved depreciation worksheet reflects all your answers in a separate window as you go through the questions for

able as we went to press.) You even get a free membership to GENie, the on-line service, worth \$29.95.

TurboTax is also more extensively customizable. You can keep function-key assignments listed at the bottom of the screen and choose screen colors, for example.

TurboTax handled my tax scenario with greater ease and more depth than any other personal-tax-preparation program I've seen. Its class really shows when you get to the tough stuff, like entering income or losses from partnership K-1s.

Transferring your federal tax data over to a state return is slick as a whistle with one of *TurboTax*'s state programs. Once the state program is installed, you

choose Goto State from the Quit menu. When the state program comes up, there is all your data in its proper place from the federal file. Most states base their taxable income on the federal figures, usually with some slight modifications or extra wrinkles.

The *TurboTax* manual for your state program tells you what to change, add, or subtract in order to get your figures in final shape for the state return.

When you're ready to print, *TurboTax* draws an IRS-approved graphic Form 1040 on either a dot matrix or Hewlett-Packard LaserJet Series II, without a special tax font. Naturally, all the federal supporting forms and schedules are in proper format for the

IRS. Some states are pickier, so you may need to hand-copy your state results onto the official state form or resort to other expedients.

TurboTax gives you lots of professional-level tax-computing power. Its formidable array of features is presented in a logical and accessible manner.

List Price: *TurboTax*, \$75 federal, \$40 each for any of 41 states. Upgrades for registered users: half price for federal program, \$25 for each state. **Requires:** Either 384K RAM and DOS 2.0 to 3.1 or 512K RAM and DOS 3.2, ChipSoft Inc., 5045 Shoreham Pl., San Diego, CA 92122; (619) 453-8722.

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—Public Relations Writing, Second Edition, Wadsworth 1986

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—The Wall Street Journal, Tuesday, Oct. 10, 1989

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—San Francisco Chronicle, Oct. 12, 1989

There's a Germ of an Idea Hiding Somewhere In This Sentence

'Without a hard disk drive, there is no way of getting to information on the disk, except to re-format that sector--thus destroying all the files.'

—Los Angeles Times, October 11, 1989

PC Magazine pays \$50 and a PC Magazine T-shirt if we use your submission in Abort, Retry, Fail? Warning: Don't write on the original if it might be reprinted; mark up a photocopy or use a PostIt. In case of duplicate entries, the neatest entry wins. Winners this issue: Peter D. Esser (Math Chips); Jeff Sutton (one mistaken keystroke); Richard Ismach (5 IPS); Rick Fischer (PR SIGnature); David Gertler (Hewlett-Packard IID); Aaron Hsu ("without a hard disk").

New Math Meets New Math Chips

"The math-coprocessor marketplace stands to heat up this week with the expected shipments of 387-compatible chips from two semiconductor startups. Cyrix Corp. and Integrated Information Technology Inc. (IIT) each plan to begin shipping processors that officials from both companies claim are **50 to 200 times** as fast as Intel Corp.'s 387 math chip, while using a fraction of the power...."

"Cyrix will release the FasMath processor, which speeds math-intensive applications by as much as **200 percent** and applications such as Autodesk Inc.'s AutoCad by about **30 percent**.... The IIT 3C87 chip runs as much as **50 percent** faster than the Intel 387..."

—PC Week, Oct. 2, 1989



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The Year in Review (Summer Beach Edition)

From the "10 Most Important Hardware Introductions of 1989" in *Personal Computing's* October 1989 edition. October magazines typically reach readers in September and have July-August editorial deadlines:

"5. Hewlett-Packard LaserJet IID—A 4 page-per-minute laser printer at \$1,495. In addition, the IID is the first laser to print on both sides of the paper."

The IID runs at 4ppm and costs \$1,895. It's the \$4,295 HP IID, a 1988 product, that handles duplex printing—as does the much older HP 2000."

4 OUT OF 5 DELL CUSTOMERS WILL BE COMPLETELY SATISFIED.

7) If you could make any changes or improvements to our products, what would they be? (Please list your top three suggestions)

Just keep lowering your prices

(28-30)

7) If you could make any changes or improvements to our products, what would they be? (Please list your top three suggestions)

Reduce Cost

(28-30)

7) If you could make any changes or improvements to our products, what would they be? (Please list your top three suggestions)

Sell them at an even lower price

(28-30)

7) If you could make any changes or improvements to our products, what would they be? (Please list your top three suggestions)

Drop the price /

(28-30)

7) If you could make any changes or improvements to our products, what would they be? (Please list your top three suggestions)

GIVE THEM AWAY FREE.

(28-30)

We've lowered, reduced and dropped
the price of the Dell System[®] 325. See inside
for details.

800-426-5150

For a free product catalog, call us. For Dell in Canada, call 800-387-5752.



GREAT IDEAS JUST KEEP COMING TO US.

Dear Customer,

Thank you for purchasing your Dell Computer Corporation personal computer.

Please take a moment to fill out and return our brief questionnaire. It's postage-paid!

1) Which PC product(s) did you purchase from Dell Computer Corporation?

a) PC model 310 40MB

b) Monitor VGA Color Plus

c) Other products Epson Printer

2) Is this your first Dell PC purchase?

a) ☐ Yes b) ☒ No

3) Are you happy with your purchase?

On a scale of 1 to 9 where 9 indicates completely satisfied and 1 indicates not at all satisfied, how satisfied are you with your purchase? (enter number) 9

If unsatisfied, please explain why: _____

4) Did your computer arrive in good working order?

a) ☒ Yes b) ☐ No

If No, what was wrong? _____

5) What do you like best about our computers? Please rank importance to you: 1 = most important, 2 = next most important, etc.

a) Product Design

b) Price

c) Quality

d) Performance

e) On-Site Service

f) Technical Support

g) Documentation/Installation Materials

6) If you could make any changes or improvements to our products, what would they be?

Smaller Footprint

High Performance graphics capabilities

Larger cord for keyboard

7) Please briefly describe one area where Dell could improve its customer service.

Clone Susan Beebe. As usual she had all the answers and was great to work with.

8) What new products would you like to see from Dell Computer Corporation?

a) ☐ Computer Systems Laptop

b) ☐ Peripherals _____

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Michael Dell
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COMPLETED

Between the phone and the mail, we hear from our customers over 5,000 times every day.

Turn the page and we'll show you how their input has helped Dell lead the industry in customer satisfaction two years in a row.

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